WASTE MANAGEMENT
7227 NE 55th Avenue
Portland, Oregon 97218
(503) 331-2262

November 8, 2021

U.S. Environmental Protection Agency
Region 10
Attn: Scott Wilder
wilder.scott@epa.gov

RE: Administrative Compliance Order on Consent (Docket No. CAA-10-2021-0055)
60-Day Report

Dear Mr. Wilder:

Riverbend Landfill Co. (RLC) is submitting this letter pursuant to the Administrative Compliance Order on Consent (Docket No. CAA-10-2021-0055) (ACO), effective September 10, 2021. RLC hereby submits documentation verifying compliance with Paragraphs 57, 59 and 63 through 68 of the ACO and verifies that all milestones associated with the submittal of the updated Gas Collection and Control System (GCCS) Design Plan and implementation of Enhanced Surface Emission Monitoring (SEM) criteria required by Paragraphs 57 and 68 of the ACO have been completed in advance of the required timeframes. A summary of the applicable requirements under the ACO and actions taken by RLC on these Paragraphs follows. Capitalized terms used herein but not defined shall have the meanings set forth in the ACO.

Submittal of Updated GCCS Design Plan

> *Paragraph 57: No later than 60 days after the Effective Date of this Order, Respondent shall submit to the appropriate state or local permitting authority a separate revised design plan updated to include the provisions of NSPS Subpart XXX and NESHAP Subpart AAAA which will include a new SEM plan updated to include new regulatory requirements.*

On November 1, 2021, RLC submitted the revised GCCS Design Plan, updated to include the provisions of NSPS Subpart XXX and NESHAP Subpart AAAA, and a new SEM plan updated to include new regulatory requirements to Yuki Puram at the Oregon Department of Environmental Quality and EPA Region 10. A copy of the updated GCCS Design Plan and SEM plan, with evidence of delivery, is attached hereto as Attachment 1.

Implementation of Enhanced Surface Emission Monitoring Criteria

Paragraphs 58 through 68 of the ACO set forth milestones for RLC’s implementation of enhanced SEM criteria. As previously reported in our October 8, 2021 letter, RLC completed the milestones listed in Paragraph 60, 61, and 62. In October 2021, RLC completed the remaining milestones in Paragraphs 63, 64, 65, 66, and 67. Pursuant to Paragraph 68 of the ACO, documentation verifying RLC's compliance with Paragraphs 63 through 67 is attached to this letter and discussed below.

Perimeter Gas Migration Probe Monitoring

> *Paragraph 59: No later than 90 days after the Effective Date of this Order, Respondent shall implement the quarterly surface measurement of the area within a 10-foot radius of all accessible perimeter gas migration probes. Any measurement in excess of 500 ppm shall be recorded.*

RES Environmental, Inc. (RES) conducted surface measurements of the area within a 10-foot radius of all accessible perimeter gas migration probes on October 20, 2021. No measurements in excess of 500 ppm were observed.

Enhanced SEM Training

> *Paragraph 63: Within 60 days of the Effective Date of this Order, Respondent shall train all employees and contractors on the Enhanced SEM Monitoring Criteria and re-train as needed per the recommendations from the quarterly internal SEM validations.*

RLC trained all employees and contractors performing Enhanced SEM on October 20, 2021. A copy of the training handbook and attendee list is attached hereto as Attachments 2 and 3.

Enhanced SEM Verifications

> *Paragraph 64: No later than 90 days from the Effective Date of this Order, Respondent shall implement verifications of each quarterly Enhanced SEM Monitoring event by technical staff not performing the Enhanced SEM Monitoring for the following:*
>
> > *a. Path taken and implementation of Method 21;*
> >
> > *b. Documentation and reporting;*
> >
> > *c. Corrective actions;*
> >
> > *d. Monitoring data for feasibility and unusual trends;*
> >
> > *e. Calibration records and equipment maintenance in compliance with Method 21 and the manufacturers' recommendations; and*
> >
> > *f. Recordkeeping.*

The RLC Fourth Quarter 2021 Enhanced SEM and Penetration monitoring event was conducted on October 20 and 21, 2021 by (RES). RES identified 47 exceedance locations (9 surface and 38 penetration) during the event. The RLC Gas Technician reviewed all exceedance locations after the conclusion of monitoring. Corrective actions taken by RLC are described below:

- Repairs at all exceedance locations (addition of cover/bentonite, vacuum adjustments, spray foam, penetration seal repairs, etc.) were completed October 22, 2021 through October 28, 2021.

- The 10-day re-monitoring event was completed October 29, 2021. 39 of the 47 locations were observed at less than 500 ppmv. 8 of the 47 exceedance locations were observed with methane concentrations greater than 500 ppmv.

- Additional repairs were completed between November 1 and 5, 2021 and a second 10-day re-monitoring event was completed on November 8, 2021. All 8 locations were observed below 500 ppm_v.

- A second 10-day re-monitoring event will be completed by November 8, 2021.

- The 1-month re-monitoring event will be completed between November 16 and 19, 2021.

- Copies of the Work Orders for these events are included as Attachment 6

Verification of Fourth Quarter 2021 Enhanced SEM and Penetration monitoring event was completed by the Area Air Specialist and the review of collected data and procedures showed that the Fourth Quarter 2021 Enhanced SEM met the requirements outlined in the ACO. Results from the verification are presented in Attachment 4. As required by the ACO, this verification will also be completed for the First, Second, and Third Quarter 2022 Enhanced SEM events.

<u>Enhanced SEM Observations by RLC Staff and Third-Party Audit</u>

> *Paragraph 65: No later than 120 days from the Effective Date of this Order, Respondent will conduct an observation of the persons taking SEM measurements to assess appropriate monitoring is being conducted in compliance with the Enhanced SEM Monitoring Criteria by SEM-trained employees and/or contractor.*
>
> *Paragraph 66: No later than 120 days from the Effective Date of this Order, Respondent shall implement a one-time, third-party audit of the Enhanced SEM Monitoring Criteria.*
>
> *Paragraph 67: Respondent shall document the corrective actions taken within 30 days of the third-party audit if deficiencies were identified including:*

a. Corrective actions for addressing deficiencies; and

b. A timeline for the actions to be addressed.

The RLC Gas Technician observed RES during the Fourth Quarter 2021 Enhanced SEM and Penetration monitoring event on October 20, 2021. Concurrently, the third-party audit of Enhanced SEM Monitoring Criteria was conducted by SCS Engineers (SCS) on October 20, 2021. Checklists from the review are presented in Attachment 5. A summary of the findings is presented below:

- All monitoring equipment was in good working condition. All calibration gases were valid. Equipment was capable of recording GPS data as required.
- Devices were set with a low alarm setpoint of 300 ppm_V.
- Enhanced SEM was observed at the gas migration probes, along the serpentine path, and at penetrations.
- Technicians used handheld GPS devices for documenting exceedance locations accurately.
- Technicians were observed looking for areas off the path with possible elevated emissions.
- When the low alarm setpoint (300 ppmv) was triggered, the technicians were observed stopping forward progress to search for possible exceedances.
- When locations over 500 ppmv were observed, the technicians would use several pin flags for marking surface exceedances. One flag was typically used for penetrations, this practice was observed as effective for penetrations since they are discrete locations.
- GPS locations were documented in an electronic log which was later submitted to RLC.
- The RES technician was observed occasionally raising the monitoring probe above 4 inches. This was noted by the SCS auditor as a monitoring deficiency and corrected in the field.
- The RES technician was observed only monitoring the downwind and sides of penetrations at the first few locations. The SCS auditor informed the RES technician that the entire penetration must be checked. The RES technician corrected the monitoring practices in the field and continued to monitor all sides of penetrations.

Corrective Actions/Timeline for Corrections

Both audit findings were corrected in the field on October 20, 2021. Additionally, RLC discussed the results of the audit verbally on October 21, 2021 with RES. RES indicated that RES would emphasize probe height and penetration monitoring procedures with staff after their return from monitoring and prior to the next monitoring event.

Closing

Please contact me at 602-757-3352 or by e-mail at jdenson@wm.com if you have any questions regarding this letter or require further information.

Sincerely,

James L. Denson
PNW/BC Environmental Protection Manager

ATTACHMENT 1

UPDATED GCCS DESIGN PLAN

RIVERBEND LANDFILL
13469 SW HIGHWAY 18
McMINNVILLE, OREGON 97128

REVISED
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
DESIGN PLAN

Prepared for

Riverbend Landfill Co.
13469 SW Highway 18
McMinnville, Oregon 97128

Prepared by

Carlson Environmental Consultants, PC
1015 4th Ave W – Suite G
Olympia, Washington 98502
704-283-9765

October 29, 2021

Riverbend Landfill Co.
13469 SW Highway 18
McMinnville, OR 97128
(503) 472-8788
(503) 434-9770 Fax

October 29, 2021

Yuki Puram
Oregon Department of Environmental Quality
Western Region – Salem Office
4026 Fairview Industrial Dr. SE
Salem, Oregon 97302

Air Operating Permits
US Environmental Protection Agency
Mail Stop OAQ-108
1200 Sixth Avenue
Seattle, Washington 98101

RE: Updated NSPS XXX / NESHAP AAAA GCCS Design Plan
Riverbend Landfill Co. – Riverbend Landfill
Oregon Title V Operating Permit No. 36-0011-TV-01

Dear Ms. Puram,

Riverbend Landfill Co. (RLC), is hereby submitting an updated GCCS Design Plan (Plan) for the Riverbend Landfill (Riverbend). The GCCS design outlined in this Plan complies with the specifications for active collection systems as stipulated in §60.769 of the NSPS XXX and §63.1962 of NESHAP AAAA.

The Plan incorporates the site's existing GCCS, interim GCCS considerations, and the future GCCS build-out. In addition, this Plan includes proposed alternatives, which allow the site to maintain compliance with the regulations while considering site specific conditions.

Please contact William Hickey at 503-331-2239 or whickey2@wm.com if you have any questions or require additional information.

Sincerely,
Riverbend Landfill

David K. Lowe
Director of Disposal Operations

Signature and P.E. Certification

This revised NSPS XXX/NESHAP AAAA GCCS Design Plan for the Riverbend Landfill has been prepared by Carlson Environmental Consultants, PC as authorized by the Riverbend Landfill Co.

I certify that the GCCS as described in this Plan meets the design requirements specified in 40 CFR §60.769 and 40 CFR§63.1981(d) and any alternatives pursuant to 40 CFR §60.762(b)(2) and 40 CFR§63.1981(d). It also addresses relevant portions of 40 CFR 63 Subpart AAAA (NESHAP AAAA) which are not duplicative of NSPS XXX. I further certify that this report was prepared by me or under my direct supervision, and that I am a duly registered Professional Engineer under the laws of the State of Oregon.

REGISTERED PROFESSIONAL ENGINEER
91189PE
OREGON
MAY 10, 2016
SETH A. NUNES

10-28-21

Seth A. Nunes, P.E.

RENEWAL DATE: 12-31-21

Facility Approval

If the Agency requires the facility to modify this plan, the modification applies prospectively, not retroactively to the landfill. Changes to the plan requested by the agency that affect GCCS operations or monitoring or recordkeeping do not take effect until agency approves the requested plan modifications.

Riverbend Landfill

David K. Lowe

Facility Representative Name

Director of Disposal Operations

Facility Representative Title

Signature

TABLE OF CONTENTS

SIGNATURE AND P.E. CERTIFICATION II

1 INTRODUCTION 1-1

1.1 PURPOSE 1-1
1.2 APPLICABILITY 1-1
1.3 IMPLEMENTATION SCHEDULE FOR GCCS OPERATIONS 1-2

2 DESIGN CRITERIA 2-1

2.1 LANDFILL GAS COLLECTION DESIGN 2-1
2.1.1 Gas Collection Density 2-2
2.1.2 Landfill Gas Collection System Expandability 2-3
2.1.3 Fill Settlement 2-4
2.1.4 Landfill Gas Extraction Component Connections to LFG Transmission Piping 2-4
2.1.5 GCCS Materials 2-5
2.1.6 Well, Collection Device, & Pipe Network Loading 2-5
2.1.7 Nonproductive Areas 2-5
2.1.8 Asbestos and Non-degradable materials 2-6
2.1.9 Landfill Gas Extraction Design 2-6
2.1.10 Depths of Extraction Wells/Collection Device 2-7
2.1.11 LFG Collection Devices 2-7
2.1.11.1 Vertical LFG Wells 2-7
2.1.11.2 Horizontal Gas Collectors 2-8
2.1.12 Well and Collection Device Perforation/Slots and Backfill 2-8
2.1.13 Well/Collection Device Backfill 2-8
2.1.14 Accessibility 2-8
2.1.15 Landfill Gas Well/Collection Device – Installation Requirements 2-9
2.1.16 Leachate and Condensate Management 2-9
2.1.17 Control Systems 2-9
2.1.18 Open/Utility Flare/Non-Enclosed Flare 2-10
2.1.19 Enclosed Flare 2-10
2.1.20 Treatment System 2-10

3 DESIGN CONSIDERATIONS FOR ACTIVE CONDITIONS 3-1

3.1 LANDFILL DESCRIPTION 3-1
3.2 EXISTING GAS COLLECTION FLOW 3-1
3.3 CONTROL DEVICES AND INITIAL PERFORMANCE TEST 3-2
3.3.1 Sizing Gas Collection System/Piping Network 3-3
3.3.2 Nonproductive Areas 3-3

3.3.3 Asbestos and Non-Degradable Materials *3-3*
3.4 Previously Approved Alternatives, HOVs, and Variances 3-4

4 DESIGN CONSIDERATIONS FOR INTERIM CONDITIONS 4-1

4.1 Gas Collection System Expansion during Interim Conditions 4-1
4.1.1 Compatibility with Refuse Filling Operations *4-4*
4.1.2 Landfill Cover Properties *4-4*

5 DESIGN CONSIDERATIONS FOR CLOSURE CONDITIONS 5-1

5.1 Landfill Gas Collection 5-1
5.1.1 Landfill Gas Generation Rates and Flow Characteristics *5-2*
5.1.2 Landfill Cover Properties *5-3*
5.1.3 Integration with Closure End Use *5-3*
5.1.4 Operation of GCCS after Closure *5-3*

6 PROPOSED ALTERNATIVES 6-1

6.1 Interim Collection 6-1
6.3 Positive Pressure under a Synthetic Cover 6-2
6.4 Early Installation of Collection Devices 6-2
6.5 Monitoring During Collection Device Raising 6-2
6.6 Monitoring of Leachate Risers 6-3
6.7 Operation of Near Surface Collectors for Cap Stability 6-3
6.8 Surface Emission Monitoring (SEM) 6-3
6.8.1 Exclusion of Dangerous Areas from SEM requirements *6-3*
6.8.2 Alternative Remedy for SEM events *6-4*
6.8.3 SEM for Closed Portions of the Landfill *6-4*

7 OPERATING CLARIFICATIONS 7-1

7.1 Alternative Timeline Request 7-1
7.2 Frequency to Update As-built Drawings 7-2
7.3 Establishment of a Higher Operating Value (HOV) for Temperature 7-3
7.4 Clarifications for Enhanced Monitoring 7-4
7.4.1 Timing for Initiation *7-4*
7.4.2 Down-Well Monitoring *7-4*
7.4.3 Carbon Monoxide Measurement *7-5*
7.5 Certification of Prior Reports 7-6

Appendices

APPENDIX A - Calculations
A-1: Landfill Gas Generation Rate Modeling
A-2: Condensate Generation Calculations
A-3: Pressure Drop Analysis Results

A-4: Positive Pressure Calculations

APPENDIX B - GCCS Design Drawings

APPENDIX C - Surface Emissions Monitoring Plan

APPENDIX D - NSPS Determination Letters and State Approval Letters
D-1: Temperature HOV Correspondence and HOV Listing
D-2: Leachate Collection System HOV Correspondence
D-3: Early Monitoring Clarification ADI

APPENDIX E - Treatment System Monitoring Plan

APPENDIX F - Initial Performance Test

TABLES AND ILLUSTRATIONS

Table 1 – List of Control Devices

Table 2 – Agency Approved Variances

1 INTRODUCTION

1.1 Purpose

This document serves as a revised Landfill Gas Collection and Control System (GCCS) design plan (Plan) for the Riverbend Landfill (Riverbend) in accordance with requirements of 40 Code of Federal Regulations (CFR) New Source Performance Standards Part 60, Subpart XXX, for Municipal Solid Waste Landfills (NSPS). NSPS XXX was finalized August 29, 2016 and took effect on October 28, 2016 and applies to all MSW landfills that commenced construction, reconstruction, or modification after July 17, 2014. The purpose of this revised document is to provide a design plan that meets the requirements of both NSPS XXX and the revised requirements of 40 CFR National Emission Standards for Hazardous Air Pollutants (NESHAP) Part 63 Subpart AAAA, incorporate the most current site information available, and to provide the Administrator the design standards and calculations used to prepare this Plan. Sections of the Plan that did not require update since the last design plan dated October 2, 2018 were not revised; however, this Plan is a stand-alone document and completely replaces the prior version.

The regulatory language and requirements of NSPS XXX and NESHAP AAAA are similar but not identical. For ease of review, similar citations are grouped together with the requirements summarized, rather than reproduced exactly, for each.

1.2 Applicability

> **§60.762(b)(2)** If the calculated NMOC emission rate is equal to or greater than 34 megagrams per year, the owner or operator shall:

In accordance with 40 CFR 60.762(b)(2), a NMOC emission rate report that demonstrated Riverbend exceeded the 34 Mg/yr. threshold was reported to EPA Region 10 Office of Air and Waste on October 5, 2017, as required. For this reason, an NSPS XXX compliant GCCS was installed and operated in accordance with the NSPS as stated below.

> **§60.762(b)(2)(i)** Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year:
>
> **§60.762(b)(2)(ii)** Install and start up a collection and control system that captures the gas generated within the landfill as required by paragraphs (b)(2)(ii)(C) or (D) and (b)(2)(iii) of this section within 30 months after:
>
> (A) The first annual report in which the NMOC emission rate equals or exceeds 34 Mg/yr, unless Tier 2 or Tier 3 sampling demonstrates that the NOMC emission rate is less than 34 Mg/yr, as specified in §60.767(c)(4); or §60.762(b)(2)(ii)(B).

The submittal of this document fulfills the requirement for the Facility to prepare a GCCS Design Plan in accordance with 40 CFR 60.762(b)(2) in Sections 2 through 5.

The NMOC emission rate report dated October 5, 2017 also indicated the landfill exceeded the 50 Mg/year threshold and thus is subject to NESHAP AAAA. Note that 40 CFR 63.1981 specifies that a new Design Plan is not required under NESHAP AAAA provided that a Design Plan was previously submitted under NSPS XXX. The original NSPS XXX Design Plan was submitted on October 2, 2018. This updated plan restates information from the original 2018 plan and demonstrates how the site will comply with NESHAP AAAA.

The Design Plan outlines the methodology employed to design a landfill gas collection and control system that will collect, transport, and dispose of the landfill gas generated in the entire permitted landfill at final grades. In addition, the Facility's proposed alternatives and variances to the standard, including monitoring record keeping, and reporting requirements of the NSPS and NESHAP are discussed in Section 6. Section 7 outlines how the site will implement certain monitoring, recordkeeping and reporting requirements.

The GCCS design outlined in this Plan complies with the specifications for active collection systems as stipulated in §60.769 of the NSPS XXX and §63.1962 of NESHAP AAAA.

Furthermore, NSPS XXX and NESHAP AAAA specifically require the gas collection system to be designed in accordance with general conditions that are contained within those rules. These regulations will be found throughout this document in addition to the means on how the landfill is meeting or plans on meeting these regulations. Again, any variations for NESHAP AAAA are discussed directly. For instance, enhanced monitoring requirements particular to NESHAP AAAA are discussed specifically.

1.3 Implementation Schedule for GCCS Operations

As of September 27, 2021, Riverbend Landfill is operating in compliance with both NSPS XXX and the revised requirements of NESHAP AAAA. If the Agency requires the facility to modify this plan, the modification applies prospectively, not retroactively to the landfill. Changes to the plan requested by the Agency that affect GCCS operations, monitoring or recordkeeping do not take effect until the Agency approves the requested plan modifications.

2 DESIGN CRITERIA

The GCCS at this site has been designed in a manner consistent with NSPS XXX and NESHAP AAAA requirements as outlined below.

2.1 Landfill Gas Collection Design

The following listed NSPS regulations dictate when gas must be collected from areas in which municipal solid waste (MSW) has been deposited in the landfill:

> **§60.762(b)(2)(ii)(C)(2) & §63.1958(a)** Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade.
>
> [*This regulatory citation is commonly known as the 5/2 yr rule, and will be called such when referenced in this design plan.]*

Gas extraction devices and the installation and/or expansion of the pipe network to connect the devices into the gas collection system, are designed to be installed in all areas with waste that has reached the age of 5 years or older if active; and in waste that has reached the age of 2 years or more if closed or at final grade. Furthermore, the surface emission monitoring (SEM) performed in accordance with §60.763/§63.1960 in these same areas, and addressed below in the Gas Collection Density, Section 2.1.1, will demonstrate compliance with this requirement.

Additionally, the GCCS is designed to comply with the following regulations:

> **§60.762(b)(2)(ii)(C)(3) & §63.1959(b)(2)(ii)(B)(3)** Collect gas at a sufficient extraction rate;
>
> **§60.762(b)(2)(ii)(C)(4) & §63.1959(b)(2)(ii)(B)(4)** Be designed to minimize off-site migration of subsurface gas.

The GCCS is designed to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved by sizing, installing, and operating collection elements (which are discussed in the sections below) that sufficiently collects the landfill gas, which include, adequately sized transmission headers and laterals (pipe network), gas moving equipment (blower(s)), and controlled in a manner that is expected to handle the estimated LFG flow rate. Per the definition in §60.761 and §63.1990, collecting at sufficient rate can be determined by maintaining negative [gauge] pressure at all wellheads without causing excessive air infiltration through the landfill cover.

Design criteria are discussed below and the calculations and drawings for the designs are provided in the Appendices A and B.

The USEPA's Landfill Gas Emissions Model (LandGEM) is a design 'tool', which incorporates site-specific characteristics to project future landfill gas generation.

In addition to the site-specific characteristics (waste acceptance rate, type, liner/cap configuration, etc.), the current LFG extraction rate is also being used to determine the site's projected gas curve. Actual operating parameters may dictate changes in the system flow characteristics and process equipment as the system is modified. These changes will be made in accordance with the applicable rules as dictated by actual site conditions at the time of construction.

The GCCS header/lateral pipe network at final build-out is designed to accommodate the anticipated maximum flows; however, there may be interim site conditions that require the temporary installation of a sacrificial pipe network sized to convey interim gas flows.

The portions of the pipe network that are planned for use as part of the final design will be appropriately sized to handle the maximum anticipated gas flows in the portion of the landfill at closure.

2.1.1 Gas Collection Density

NSPS XXX and NESHAP AAAA require a gas collection system be designed to ensure sufficient density of the LFG extraction points, as stated below:

> **§60.769(a)(2) & §63.1962(a)(2)** The sufficient density of gas collection devices determined in this section shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

Per the definition stated in §60.761 and §63.1990, "sufficient density" means "any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this subpart."

The well spacing required to achieve comprehensive control of LFG is a function of many parameters including liner type, cover type, surrounding geology/hydrogeology, landfill geometry, well depth, waste composition and age, and the presence of liquids within the landfill. Mathematical models can be developed to estimate the zone of influence of a well. However, due to the conditions listed below and the inherent variability of waste properties within a landfill, many parameters such as permeability, channelized flow, saturated zones, and the effect of daily and intermediate cover soil layers are extremely difficult or impossible to define adequately. The error introduced because of the required simplifying assumptions and estimated properties produces results that are often less reliable than the application of extensive industry experience.

The factors and site-specific conditions that are typically used to establish adequate well spacing, which may change as the landfill is built out and ages, may include the following:

- SEM Results
- Site-Specific Conditions at the time of installation
- Permeability of soils, waste materials, and/or final cover capping systems
- LFG generation rate
- Moisture
- Past Experience/Engineering Judgment
- LFG temperature
- Waste Age
- Waste composition

Please note that the preceding list is not intended to be comprehensive.

This approach is consistent with spacing criteria used at other landfills and should effectively reduce the potential for surface emissions and subsurface migration. The average spacing of the extraction wells currently varies from approximately 100 to 300 feet apart. This spacing has been proven sufficient over time.

This spacing may vary in current or interim conditions. In addition, if needed, horizontal collection trenches will be used to control LFG. Based on extensive industry experience, the LFG collector spacing shown should be adequate to provide comprehensive control of the LFG as required at full GCCS build out. If this spacing is not adequate to meet the required operating standards, additional collectors will be installed as necessary.

Additionally, properly designed, installed, and operated gas collection component density can be demonstrated in the field by use of the Surface Emission Monitoring (SEM) requirements contained in 40 CFR 60.763 and §63.1958(d). Refer to Appendix C for the Surface Emissions Monitoring Plan.

2.1.2 Landfill Gas Collection System Expandability

> **§60.769(a)(1) & §63.1962(a)(1)** The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

Expandability of the GCCS is achieved by installing items such as in-line isolation valves, flange adapters with blind flanges, and/or HDPE butt caps along the header and lateral piping. This allows the GCCS to be modified/expanded as needed in the future.

2.1.3 Fill Settlement

Settlement will occur due to decomposition of the refuse. To accommodate this condition, the GCCS components are designed and installed with several features to account for this settlement including:

- Connection of LFG extraction devices to the LFG transmission piping via a flexible pipe or hose connection. This allows the LFG piping to accommodate changes in the orientation of the LFG transmission piping or LFG extraction well.
- Installation of LFG transmission piping at sufficient slopes so that reasonable amounts of differential and total settlement may occur without causing pipe breakage or disrupting the overall flow gradient of the LFG transmission piping.
- Adequate piping used for the construction of the header and lateral transmission system. Piping materials will be determined as needed during each phase of the construction. Typically, piping that is flexible and absorbs differential settlement without breaking or cracking will be used.

2.1.4 Landfill Gas Extraction Component Connections to LFG Transmission Piping

This section details how the collection devices are connected to the GCCS.

> **§60.769(b) (3) & §63.1962(b)(3)** Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly must include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.

The collection devices will be connected to the collection header pipes via lateral piping. The lateral piping will be connected to the header either above or below the landfill surface.

The connector assemblies (extraction wellheads) will be located above grade. These assemblies include a positive closing throttle valve, necessary seals and couplings, access couplings, and sampling ports.

2.1.5 GCCS Materials

GCCS piping materials will be constructed of PVC, HDPE, fiberglass, stainless steel, or other non-porous corrosion resistant material. These materials will be designed and installed to:

- Withstand installation forces;
- Withstand static and settlement loads;
- Withstand traffic loads;
- Allow for extension to comply with emission and migration control standards;
- Resist decomposition heat; and
- Include sufficient perforation to allow for adequate gas collection.

2.1.6 Well, Collection Device, & Pipe Network Loading

The applied loads on GCCS components within the landfill, as well as settlement forces, cannot accurately be predicted due to the non-homogeneous nature of the refuse within the landfill. The GCCS components within the landfill are consistent with those at other landfills, which have been in-place for extended periods of time and verified to be capable of withstanding applied static and settlement forces. Various sections of the header or laterals may lose grade, collect condensate, requiring replacement or repair. In the event, those GCCS component failures occur, the landfill will repair/replace each component as required to maintain NSPS XXX and NESHAP AAAA compliance.

2.1.7 Nonproductive Areas

Nonproductive areas may be excluded from the requirements to have a NSPS/NESHAP compliant control device(s) in the area, as stated below:

> **§60.769(a)(3)(ii) and §63.1962(a)(3)(ii)** Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

As areas of the landfill that are determined to be nonproductive, will be excluded per the requirement stated above. Copies of required documentation, including supporting calculations will be on file. The nonproductive areas at the landfill may change over time and therefore, records of these areas will also be kept on file. Nonproductive areas may occur during active, interim, and closed conditions.

2.1.8 Asbestos and Non-degradable materials

Any area of the landfill that contain only asbestos and/or non-degradable materials are not required to be controlled in accordance with the NSPS XXX and NESHAP AAAA, as stated below:

> **§60.769(a)(3)(i) & §63.1962(a)(3)(i)** Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided in the applicable rules. The documentation must provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and must be provided to the Administrator upon request.

If the landfill excludes asbestos or nondegradable material the landfill will retain supporting documentation and will not be required to collect LFG from these segregated areas. Areas or planned areas containing these types of waste are described in the appropriate section of this Design Plan.

2.1.9 Landfill Gas Extraction Design

Landfill gas extraction is normally implemented using gas collection devices that are connected to a vacuum source. This section describes the design consideration of these gas collection devices. Specific NSPS XXX/NESHAP AAAA requirements that apply to the landfill gas collection and extraction components include the following:

> **§60.769(a)(1) & §63.1962(a)(1)** The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.
>
> **§60.769(b)(1) & §63.1962(b)(1)** The landfill gas extraction components must be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other non-porous corrosion resistant material of suitable dimensions to: Convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system must extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors must be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations must be situated with regard to the need to prevent excessive air infiltration.
>
> **§60.769(b)(2) & §63.1962(b)(2)** Vertical wells must be placed so as not to endanger underlying liners and must address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors must be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices must be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

In general, the collection devices are connected to the collection system via header and lateral piping. The lateral piping is connected to the header above or below the landfill surface depending on the sequencing of the refuse addition to the landfill, and the final GCCS design.

Vertical collection wells, commonly known as "gas wells," include extraction wellheads (connector assemblies) that are located above grade. These wellheads include a positive closing throttle valve, necessary seals and couplings, access couplings, and a minimum of two sampling ports; all which aid in the prevention of air intrusion, allow for proper operation of the wellheads, and allow the wellheads to be sampled and monitored.

2.1.10 Depths of Extraction Wells/Collection Device

Vertical wells cannot endanger the underlying liner system and must address the occurrence of perched liquids within the landfill. The vertical wells will be installed at the appropriate depths as designed by the professional engineer in a manner to capture as much landfill gas without putting the landfill liner system at risk.

Practical site-specific factors that may change over time will impact the depths of the vertical wells. Some of these factors include the following:

- Availability of accurate liner construction records;
- Well locations above or near liner side-slopes or other areas in which the liner elevation changes rapidly; and
- Obstructions or other technical difficulties that may impact the drilling operations.

2.1.11 LFG Collection Devices

Vertical and horizontal gas wells are typically used to extract LFG from the landfill. The design aspects that are used to address air intrusion in these types of gas wells are included in this section.

The gas collection system is designed to prevent air infiltration through the cover, refuse contamination of the collection elements, and direct venting of LFG to the atmosphere.

2.1.11.1 Vertical LFG Wells

To a large extent a well's zone of influence (ZOI) is dictated by the amount of vacuum that can be applied without causing an excessive amount of air intrusion into the landfill. Typically, to reduce air intrusion and thereby increase the ZOI, the final well depth will be determined by the site and a professional engineer. Industry experience will be used to determine the depths for the slotted and unslotted portion of the pipe that provides the proper balance between air intrusion control and LFG collection efficiency. Air intrusion is also minimized by using soil backfill in the upper zone of the vertical wells. In addition, a hydrated bentonite plug is used where the pipe penetrates the landfill soil cover.

Further, air intrusion and LFG emissions will be controlled through periodic monitoring and adjustment of the GCCS in coordination with appropriate maintenance of the landfill cover system.

Typical well design and vertical collection wells will be installed in the approximate locations found in Appendix B.

2.1.11.2 Horizontal Gas Collectors

With horizontal gas collectors (HGCs), the best way to limit air intrusion is by increasing the amount of refuse that is placed on top of them. However, since HGCs are often installed near the surface of the landfill, atmospheric air is often pulled into them, resulting in some oxygen content.

2.1.12 Well and Collection Device Perforation/Slots and Backfill

Collectors are perforated to allow LFG entry without excessive head loss, and the surrounding gravel will be sized to prevent blocking of perforations

There are many site-specific factors that will be examined to determine the length of the slotted portion of the gas well. For example, perforated/slotted section of the gas collection device may vary based on the following conditions:

- Depths of perched liquids contained in the landfill;
- Mitigation of odors (slots/perforations may be extended for this reason); and
- Installation of deeper slots to extend ZOI (may be beneficial in sites with synthetic caps.)

2.1.13 Well/Collection Device Backfill

Gravel, washed aggregate, other acceptable crushed stone (with low carbonate content), and/or other inert non-calcareous material of sufficient size is specified to prevent penetration or blockages of the LFG collector pipe perforations/slots. Note that an acceptable substitute may be used in lieu of the aforementioned materials if it prevents blockage/penetration of the collector pipe perforations/slots.

2.1.14 Accessibility

Accessibility of the GCCS components is achieved by installing commonly accessed components (such as wellheads, monitoring ports, etc.) above the landfill surface. For future GCCS expansions, the valves, wellheads, and monitoring ports will continue to be installed to provide accessibility. §60.769(a)(1) and §63.1962(a)(1) require the

GCCS to be designed with the ability to isolate individual components for repair or troubleshooting without having to shut down the entire collection system.

2.1.15 Landfill Gas Well/Collection Device – Installation Requirements

Vertical Gas Extraction Wells (VGEWs) and Horizontal Gas Collectors (HGCs) that are constructed for LFG collection will have sufficient cross-section to allow for their proper construction and completion, and placement of gravel or other approved backfill material. The wells and collectors will be constructed under supervision of a construction quality assurance program implemented by the landfill.

2.1.16 Leachate and Condensate Management

In accordance with the leachate and condensate management requirement included in §60.769(a)(1) and §63.1962(a)(1), leachate management is accomplished by using a leachate collection and management system.

Condensate management will be accomplished by sloping the LFG transmission piping to low points in the GCCS piping for collection of the condensate. Condensate collection sumps/drains are located at these low points, to collect the condensate and remove it from the transmission piping. Condensate collected in drains/sumps is managed in accordance with the landfill's operating plan.

2.1.17 Control Systems

NSPS XXX/NESHAP AAAA specifically require that LFG collected by the gas collection system be sent to an NSPS XXX/NESHAP AAAA compliant control device(s). These requirements are listed below:

> **§60.762(b)(2)(iii) & §63.1959(b)(2)(iii)** Route all the collected gas to a control system that complies with the applicable requirements.

The required operational performance of these components is stipulated by the following requirements which state:

> **§60.762(b)(2)(iii)(A) & §63.1959(b)(2)(iii)(A)** A non-enclosed flare designed and operated in accordance with the parameters established in §60.18 and §63.11(b), except as noted.
>
> **§60.762(b)(2)(iii)(B) & §63.1959(b)(2)(iii)(B)** A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The reduction efficiency or parts per million by volume must be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the test methods specified in §60.764(d). The performance test is not required for boilers and process heaters with design heat input capacities equal or greater than 44 megawatts that burn landfill gas for compliance with this subpart.

§60.762(b)(2)(iii)(C) & §63.1959(b)(2)(iii)(C) Route all collected gas to a treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-BTU gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to applicable requirements of this section.

§60.762(b)(2)(iii)(D) & §63.1959(b)(2)(iii)(D) All emissions from any atmospheric vent from the gas treatment system are subject to the requirements of paragraph (b)(2)(iii)(A) or (B) of this section. For purpose of this subpart, atmospheric vents located on the condensate storage tank are not part of the treatment system and are exempt from the requirements.

The control system may consist of one or more control devices and change over time; therefore, all chosen control devices will be designed, installed, and be operated in compliance with the required regulations.

The capacity of the control system may increase/decrease over time as the volume and quality of LFG produced by the landfill changes. Therefore, the control device(s) or extraction system(s) chosen for the active, interim, and closure timeframes may vary depending on the LFG quantities produced and collected by the GCCS. Proposed changes to the control system will be evaluated to determine if an air construction permit and/or modification to the site's Title V permit is necessary. The following are the listed NSPS XXX/NESHAP AAAA control devices that will be implemented as needed and as applicable.

2.1.18 Open/Utility Flare/Non-Enclosed Flare

When in operation, the open/utility flare(s) will be continuously monitored for the presence of a flame. Monitoring for the presence of a flame will be accomplished by an ultraviolet flame scanner, thermocouple, or comparable device. Absence of a flame will cause the monitoring system to automatically turn off the LFG mover(s), and initiate the closure of either an electric or pneumatic valve at the inlet to the mover(s).

2.1.19 Enclosed Flare

When in operation, the enclosed flare(s) will operate in accordance with the combustion temperature limits based on the initial performance test and in compliance with any temperature limits resulting from any subsequent performance testing. The low temperature set point will be set above the lower temperature limit set by the most recent performance test to ensure that the enclosed flare(s) will be operated within the appropriate parameters. These operational and testing requirements are contained within the NSPS XXX and NESHAP AAAA.

2.1.20 Treatment System

When in operation, the LFG treatment system will be operated in accordance with the Treatment System Monitoring Plan located in Appendix E.

3 DESIGN CONSIDERATIONS FOR ACTIVE CONDITIONS

This section of the GCCS Design Plan describes the existing site conditions including description of the current GCCS, as applicable. This section also identifies and incorporates all previously approved alternatives, variances and higher operating values for GCCS operations.

3.1 Landfill Description

Riverbend Landfill is located in McMinnville, Oregon, and is owned and operated by Riverbend Landfill Co. The landfill is an active disposal facility with daily operations include tipping, covering, compacting, composting, cell construction, hauling, leachate collection and discharge, and equipment maintenance operations. Other operations include a landfill gas to energy (LFGTE) plant, a recycling center (material recovery facility), and a poplar tree farm that was previously used for drip irrigation of leachate.

Based on information available, Riverbend began receiving refuse in 1982, and is expected to continue receiving waste at a reduced rate until approximately 2029. Riverbend has an existing gas collection and control system that was initially designed to meet the design requirements of NSPS WWW. The system now meets the operational standards of NSPS XXX, and NESHAP AAAA. In the event that site conditions change to the extent that another revision to this plan is required, Riverbend will prepare and submit a revised GCCS Design Plan.

Currently, Riverbend has the following on site:

- One (1) 1,000 standard cubic feet per minute (scfm) enclosed flare;
- One (1) 4,500 scfm enclosed flare; and
- Six (6) internal combustion engines with treatment system.

These control devices may change based on actual flows and conditions at the landfill. Landfill gas is currently conveyed to the flares and engines from a network of vertical and horizontal collectors through a system of HDPE header pipes and laterals.

3.2 Existing Gas Collection Flow

In accordance with the NSPS and NESHAP, the gas collection system must be designed to handle the expected gas flows during the anticipated life of each component of the gas collection system. Portions of the gas collection system that are planned for inclusion in the final design must be appropriately sized to accommodate both current and future gas flows. Certain portions of the gas collection system may be deemed "sacrificial" due to filling operations or other site-specific conditions; these portions need only be sized to accommodate the gas flows that are anticipated during the time they will be in operation.

The following sections of the NSPS/NESHAP discuss the proper sizing of gas collection system**.**

> **§60.769(c) & §63.1962(c)** Each owner or operator seeking to comply must convey the landfill gas to a control through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:
>
> **§60.769(c)(1) & §63.1962(c)(1)** For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.
>
> **60.769(c)(2) & §63.1962(c)(2)** For new collection systems, the maximum flow rate must be in accordance with the applicable rules.

The LFG generation and recovery rates for the landfill were estimated using the U.S. Environmental Protection Agency (EPA) Landfill Gas Emissions Model (LandGEM). The modeling results reflect the estimated waste quantities accepted over the operating life of the site. Copies of the EPA LandGEM model print-outs are included in Appendix A.

The gas generation parameters established by the EPA in AP-42, Compilation of Air Pollutant Emission Factors, recommends a methane generation potential (L_o) of 100 cubic meters per megagram of solid waste, and a methane generation constant (k) of 0.04 year^{-1}. For converting methane to LFG, a methane content of 50 percent was assumed. The EPA LandGEM results indicate a peak LFG generation rate of approximately 3,445 scfm in 2017. Note that this value is considered conservative as discussed further in Section 5.1.1 and Appendix A-1.

3.3 Control Devices and Initial Performance Test

A Performance Test (PT) on the control system at the landfill was conducted on April 12-14, 2011, which for purposes of this plan is used to established the start date associated with the 15-year period described in §60.762(b)(2)(v)(B)/ §63.1967(b)(2). This PT report has been included in Appendix F, with appendices omitted for brevity. The full report is available upon request.

Currently, the Facility operates the control devices listed below. As new or additional control devices are added, the site will obtain proper air authorizations without having to revise this Design Plan. As new or additional control devices are added, a performance test will be completed and submitted, as required.

Table 1 - List of Control Devices

One (1) 1,000 standard cubic feet per minute (scfm) enclosed flare
One (1) 4,500 scfm enclosed flare
Treatment system/plant prior to six (6) internal combustion engines

The above table includes a treatment system, which will be operated in accordance with the Treatment Monitoring Plan located in Appendix E.

3.3.1 Sizing Gas Collection System/Piping Network

The sizing of the headers and laterals are based on the maximum expected LFG generation rate as estimated using the landfill gas generation model as described above.

The final GCCS piping system has been sized to handle this maximum estimated LFG extraction rate while maintaining vacuum throughout the header pipe. Design computations for sizing the LFG transmission piping and determining system vacuum requirements were performed and are included in Appendix A.

3.3.2 Nonproductive Areas

The rules allow for nonproductive areas to be excluded from the requirements to collect and control gas under the applicable rules, as stated below:

> **§60.769(a)(3)(ii) & §63.1962(a)(3)(ii)** Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

Currently, there are no known non-producing areas of the landfill. At such time when the landfill identifies non-producing areas, the landfill will submit a revised Design Plan with supporting documentation to exclude such area(s) from the collection requirements stated above.

3.3.3 Asbestos and Non-Degradable Materials

The rules allow that any areas of the landfill that contain only asbestos and/or non-degradable materials are not required to be controlled in accordance with the NSPS/NESHAP, as stated below:

> **§60.769(a)(3)(i) §63.1962(a)(3)(i)** Any segregated area of asbestos or non-degradable material may be excluded from collection if documented in accordance with the applicable rules. The documentation must provide the nature, date of deposition, location and amount of asbestos or non-degradable material deposited in the area, and must be provided to the Administrator upon request.

Currently, there are no known segregated areas of the landfill that contain only asbestos and/or non-degradable materials. At such time when the landfill develops segregated disposal areas, the landfill will submit a revision to the Design Plan with supporting documentation to exclude such area(s) from collection requirements.

3.4 Previously Approved Alternatives, HOVs, and Variances

With respect to monitoring that is performed at a landfill gas collection wellhead, §63.1961(a)(5) notes the following:

> Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in §63.1958(c)(1), unless a higher operating temperature value has been approved by the Administrator under this subpart or under 40 CFR part 60, subpart WWW; 40 CFR part 60, subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR part 60, subpart Cc or 40 CFR part 60, subpart Cf, you must initiate enhanced monitoring at each well….

Higher operating values for temperature that were previously approved under another rule carry through under the NESHAP. This is further reinforced by USEPA's response to public comments on the NESHAP (February 2020), which states that "*EPA is clarifying in the final rule that HOVs that have been previously approved under another MSW Landfill NSPS or EG regulation will not have to seek pre-approval for that HOV under the provisions in the NESHAP (40 CFR 63.1961(a)(5)). See sections III.D and IV.D of the preamble to the final rule.*"

Alternative limits or procedures that were approved under a different mechanism than a traditional HOV (e.g., a consent agreement, order issued by a state agency, or other enforceable mechanism) to address exceedances under a previous rule (e.g., NSPS WWW, XXX, Cc, or Cf) are assumed to also carry through under the NESHAP. Table 2 lists previously approved variances; a site-wide listing of wells with approved HOVs is found in Appendix D-1.

Table 2 - Agency Approved Variances

Well number(s)	Parameter	Approved Higher Operating Value
Site-Wide Landfill Gas Wells. Recent listing of wells dated in Appendix D-1 along with historic correspondence.	Temperature	Self-implementing established by site.
Site-Wide Leachate Collection System Connections.	Oxygen *(not applicable under XXX or AAAA)* Temperature	Not specified; exempt from compliance with these operating values

4 DESIGN CONSIDERATIONS FOR INTERIM CONDITIONS

This section of the GCCS Design Plan describes the procedures used during interim operating conditions. Interim operating conditions occur when the landfill is still actively accepting waste, and before it is closed or reaches final grades. During these interim conditions, the gas collection system is typically being installed or expanded to comply with applicable requirements, while the landfill is also balancing the requirements of the day-to-day activities of an active landfill.

According to the applicable rules the maximum LFG flow rate shall be used to design the size of the GCCS pipe network. To facilitate compliance during active landfill operations, a flexible design was developed that incorporates the operational difficulties that can occur when installing a GCCS while the facility is actively accepting refuse. Collection device locations will be determined to maintain needed flexibility during daily operations, which may include changes in refuse fill patterns, weather, waste type, and waste volumes; natural disasters; and/or other significant area events.

Interim conditions may warrant gas collection and monitoring from areas where waste has been placed, but have not yet reached final grade. Complying with the applicable rules under these conditions can be difficult due to several factors, which may include, but are not limited to, the following:

- Components may be inadvertently damaged by heavy equipment collisions during filling operations;
- Areas requiring gas collection may not necessarily coincide with filling operations;
- Pipe slopes may be altered due to loads from heavy traffic or differential settlement; and
- Components may be more prone to water accumulation due to shallower waste depths.

4.1 Gas Collection System Expansion during Interim Conditions

During interim conditions, compliance with the applicable requirements that specify additional gas collection devices and the corresponding expansion of the overall gas collection system will be maintained. These expansions will ensure that LFG will be collected at sufficient rates over the interim time frame, and will be designed and installed properly to minimize off-site migration of gas. Specific requirements that apply to gas collection during interim conditions include the following:

§60.761 & §63.1990 *Sufficient density* means any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this part.

60.769(a)(1) & §63.1962(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

§60.769(a)(2) & §63.1962(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

§60.769(a)(3) & §63.1962(a)(3) The placement of gas collection devices must control all gas producing areas, except as provided by exceptions noted in the applicable rules.

§60.765(b) & §63.1960(b) Each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan. Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

Five (5) years or more if active; or

Two (2) years or more if closed or at final grade.

§60.769(c) & §63.1962(c) Each owner or operator must convey the landfill gas to a control system through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:

§60.769(c)(1) & §63.1962(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.

§60.769(c)(2) & §63.1962(c)(2) For new collection systems, the maximum flow rate must be in accordance with applicable rules.

In compliance with these regulations, the GCCS has been designed and will be further expanded as necessary over the life of the system, to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved, in part by, appropriately sizing and installing sufficient collection elements, transmission piping, gas moving equipment, and control device(s) for the estimated maximum flow rate of LFG.

Since the operations of the landfill, which include the filling patterns and amounts of waste accepted at the landfill may change over time, there is no single design that can be presented at this time to address the location of each gas collection device and the vacuum providing network that accompanies them. Instead, during the interim period, conformance with the above regulations will be maintained and be used as the tool to determine when the system will be expanded and when upgrades to the system will be added.

A professional engineer will certify expansion of the GCCS and the measures of system performance will be verified as set forth in the NSPS XXX and NESHAP AAAA. Based upon the outcome of the system performance metrics contained in the NSPS, such as the SEM and monthly collection device monitoring requirements, the GCCS will be adjusted or modified in accordingly. This information will be used as an additional tool to evaluate the need for future expansion of the GCCS.

In Section §60.761 of NSPS XXX and §63.1990 of NESHAP AAAA, "sufficient density" is defined as "any number, spacing, and combination of collection system components . . . necessary to maintain emission and migration control as determined by measures of performance set forth in this part." Well spacing at the landfill is established based on SEM Results, site-specific conditions (waste age, waste density, moisture content, etc.), operational experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and should effectively control surface emissions and subsurface migration of LFG in accordance with applicable requirements.

In accordance with the requirements, a collection device must be installed in all areas containing waste that is 5-years or older if active; and 2-years or more if closed or at final grade. The placement of collection devices will occur in a manner that will maintain compliance with all NSPS requirements. Additionally, collection device locations and density will be determined at the time of installation to support normal operations of the landfill regarding roadways, equipment, and fill sequencing. Actual well placement may vary from the preliminary locations selected for closure conditions (see Section 5) to accommodate actual site conditions at the time of installation.

If the actual landfill gas extraction rate exceeds the capacity of the system, additional GCCS components will be designed and installed in accordance with NSPS requirements. The system flow characteristics and installed process equipment will be determined by the actual gas flow trends and site-specific conditions at the time of the modification.

The header and lateral pipeline systems will be sized to accommodate the peak flows depending on the planned life of the pipeline. If the landfill plans to operate the header and lateral pipelines only during interim conditions, and the pipelines will be dismantled/replaced prior to final build out of the system, then the pipelines will be sized for the anticipated gas flows during the period of time they are planned to be operational. The portions of the pipe network that will be incorporated into the final design will be appropriately sized to handle the anticipated gas flows into the pipeline at final build-out.

Many of the design requirements for both collection devices and the expansion of the gas collection system are found in other sections of this Design Plan.

4.1.1 Compatibility with Refuse Filling Operations

During the operating life of the site, the gas collection system will be designed to be compatible with the waste filling operations of an active landfill. As waste filling operations proceed and portions of the site reach final or near-final grades, additional GCCS components may be installed to comply with the 5-year/2-year requirements of NSPS XXX/NESHAP AAAA. Using this method allows GCCS components to be installed while minimizing interference with ongoing filling operations.

During filling operations, vertical gas extraction wells (VGEWs) may be "raised" periodically so that new refuse is not placed over the top of an existing VGEW, thereby preventing access to the well. To maintain worker safety, VGEWs will be raised as needed in advance of waste filling operations. This may require the well to be raised more than 30 days before refuse is placed around the well. During this period, the well may be inaccessible for monitoring. A variance request for these situations may be submitted as described in Section 6 of this Design Plan.

4.1.2 Landfill Cover Properties

During the normal course of operations, daily intermediate and final cover will be installed over the waste. This system limits LFG emissions, as well as water and air infiltration. The thickness and type of cover system will vary depending on when the landfill plans to place additional waste in the affected area.

5 DESIGN CONSIDERATIONS FOR CLOSURE CONDITIONS

Closure conditions apply for the closed landfill, or in areas of the active landfill that have a certified cap in place. Final design conditions also apply to the closed landfill or closed portions of an active landfill that achieved final waste grades.

5.1 Landfill Gas Collection

This section addresses the locations of GCCS components after the landfill is no longer operating under interim conditions. The GCCS will be operated in accordance with the requirements of the NSPS XXX/NESHAP AAAA for a closed landfill.

> **§60.765(b) & §63.1960(b)** For purposes of compliance with applicable requirements, each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan. Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:
>
> Five (5) years or more if active; or
>
> §Two (2) years or more if closed or at final grade.

In accordance with this requirement, a GCCS must be installed in all areas with waste that is five years or older if open, and two years or more if closed or at final grade. The current placements of collectors at the site follow this requirement.

> **§60.762(b)(2)(ii)(C)(3) & §63.1959(b)(2)(ii)(B)(3)** Collect gas at a sufficient extraction rate;
>
> **§60.762(b)(2)(ii)(C)(4) & §63.1959(b)(2)(ii)(B)(4)** Be designed to minimize off-site migration of subsurface gas.
>
> **§60.769(a)(2) & §63.1962(a)(2)** The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

In compliance with these requirements, the GCCS is designed to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved by sizing and installing sufficient collection elements, transmission piping, blower(s), and control device(s) for the estimated maximum flow rate of LFG.

The GCCS is designed to collect LFG at a sufficient rate, which is defined in §60.761 and §63.1990 as maintaining negative gauge pressure at all wellheads. Application of a negative gauge pressure and minimization of air infiltration will be verified by monitoring temperature, pressure, and oxygen concentrations at each LFG wellhead in accordance with applicable NSPS XXX/NESHAP AAAA requirements.

"Sufficient density" is defined in §60.761 and §63.1990 as "any number, spacing, and combination of collection system components necessary to maintain emission and migration control as determined by measures of performance set forth in this part." Well spacing at the landfill will be established based on SEM Results, site-specific conditions (waste age, waste density, moisture content, etc.), experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and should effectively control surface emissions and subsurface migration of LFG in accordance with applicable requirements. The proposed GCCS build-out layout for closure conditions can be found in Appendix B.

The final configuration of wells, collectors, and piping may vary from this proposed design due to modifications required during active and interim conditions. In addition, wells/collectors may have to be replaced, re-drilled, or relocated due site-specific conditions. As-built drawings of the gas collection system will be updated as required and a copy of the as-built drawing will be kept on-site.

The landfill will conduct SEM events as specified in the applicable rules in all accessible areas that have waste in-place for 5-years if active and 2-years if at or near final grade to ensure that the gas collection system was designed, installed, and is being operated properly. If the GCCS at the landfill does not meet the measures of performance, the GCCS will be adjusted or modified in accordance with applicable requirements. Typical adjustments or modifications are described in Section 6.

5.1.1 Landfill Gas Generation Rates and Flow Characteristics

The peak LFG flow rates, were used in designing the GCCS for closure conditions, as described in this section.

> **§60.762(b)(2)(ii)(C)(1) & §63.1959(b)(2)(ii)(B)(1)** An active collection system must be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment

In accordance with these requirements, the maximum expected LFG flow rate for the site was used for sizing the GCCS. LFG generation was calculated using the United States Environmental Protection Agency (USEPA) Landfill Gas Estimation Model (LandGEM), which yielded a peak value of 3,445 scfm in 2017. This value is based on the currently permitted design capacity (at time of the design plan submittal) in the solid waste disposal permits including the pending Module 11 expansion. The actual sizing and configuration of the system may change based on actual gas flows obtained from the landfill as the site nears closure. The final GCCS piping system has been sized to handle the estimated peak LFG extraction rate of 3,100 scfm while maintaining vacuum throughout the header pipe. Design computations for sizing the LFG transmission piping and determining system vacuum requirements were performed using the computerized Pipe-Flo® model. A copy of the model printout and its description are included in Appendix A.

The GCCS was designed conservatively to meet the peak flow conditions as discussed above. Actual flows measured since 2017 have been less than the modeled value assuming a 75% collection efficiency. This is due to site specific conditions at Riverbend. Through a Title V permit modification in 2020, Riverbend has obtained approval from ODEQ to use different LandGEM model input parameters to periodically estimate landfill gas generation potential. These parameters are based on actual conditions at Riverbend and suggest lower peak flows than those used for the design basis in this Plan, again reinforcing that the design is conservative.

5.1.2 Landfill Cover Properties

The purpose of the final cover system is to provide a barrier to LFG emissions, as well as water and air infiltration. A final cover system as approved by Oregon DEQ will be installed upon closure.

5.1.3 Integration with Closure End Use

Currently, the closure end-use for the site is unspecified. Any modifications to the closure end use will be reviewed by the landfill to evaluate compatibility with the GCCS. Items of concern will be mitigated by either altering the proposed closure end-use or by adjusting and/or modifying the GCCS in accordance with applicable requirements.

5.1.4 Operation of GCCS after Closure

The landfill is not required to operate the GCCS indefinitely after closure of the landfill. The requirements that pertain to removal of the GCCS are listed below:

> **§60.762(b)(2)(v) & §63.1957(b)** The collection and control system may be capped, removed, or decommissioned if the following criteria are met:
>
> The landfill shall be a closed landfill (as defined in §60.761). A closure report must be submitted to the Administrator as provided in §60.767(e);
>
> The collection and control system has been in operation a minimum of 15 years or the landfill owner or operator demonstrates that the GCCS will be unable to operate for 15 years due to declining gas flow; and
>
> Following the procedures specified in §60.764(b), the calculated NMOC emission rate at the landfill is less than 34 megagrams per year on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart.

The GCCS will be operated in accordance with applicable sections of the rules. After the GCCS meets the above-referenced requirements, the GCCS may remain in place and functional, but it will no longer be required to comply with the operational requirements of the referenced rules.

6 PROPOSED ALTERNATIVES

The rules allow for alternatives to the operational standards, test methods, procedures, compliance requirements, monitoring, record keeping, and reporting provisions to be requested in the design plan:

> **§60.767(c)(2) & §63.1981(d)(2)** The collection and control system design plan must include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions of §60.763 through §60.768 proposed by the owner or operator.

The following sections describe proposed alternatives to the NSPS XXX/NESHAP AAAA.

6.1 Interim Collection

> **§60.763(a)** Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:
>
> **(1)** 5 years or more if active; or
> **(2)** 2 years or more if closed or at final grade;

Riverbend is proposing to generally install permanent wells once final or near final grades are reached in areas of the site that have been active for 5 years or more, or closed or at final grade for 2 years or more. For cells that have been active for 5 years or more and are not yet near final grades, the leachate collection system or temporary gas extraction wells may be used for gas extraction until the final wells can be installed (i.e. final grades have been reached).

6.2 Operational Changes to Accommodate Declining Flows

Under §60.763(b)(3)/§63.1958(b)(3), collection devices that experience positive pressure after being shut down to accommodate declining LFG flows can be decommissioned. It should be noted that the term “decommissioned” is not meant to be used in the same way as the term “abandonment”. A decommissioned well is simply shut down for a period of time by fully closing the well valve or by disconnecting the well from the gas collection lateral but is maintained for potential future use whereas an abandoned well is permanently removed from the system, typically by cutting off and capping the well below grade. Well decommissioning might be necessary, for example, if a well is closed based on poor gas quality until the gas is able to recharge sufficiently to allow at least temporary collection without causing excessive oxygen infiltration. The following procedures will be used for decommissioned wells;

a. The well will be evaluated for decommissioning;
b. Quarterly surface and penetration monitoring will continue as if the well was active to make sure fugitive gas emissions are still in control;

This procedure allows the operator to keep wells present in low producing areas to maximize gas collection while maintaining compliance. Riverbend maintains a list of all such wells and provides a list of the wells that were decommissioned at any time during the reporting period in the semiannual/annual reports.

6.3 Positive Pressure under a Synthetic Cover

In areas of a landfill where a geomembrane or synthetic cover is being used, §60.763(b)(2) and §63.1958(b)(2) allow the owner or operator to develop acceptable pressure limits in the design plan. Based on the experience at similar landfills, 5" WC of pressure is acceptable in all areas where a geomembrane or synthetic cover is being used as part of the final cover system. For this reason, incidents of positive pressure less than 5" W.C. in areas where a temporary or permanent geomembrane or synthetic cover is installed will not be recorded as exceedances.

6.4 Early Installation of Collection Devices

The requirements of 40 CFR 60.765(b) and §63.1960(b) state that each collection device shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of five years or more in active areas, or two years or more if closed or at final grade. However, there may be occasions when the landfill will install collection devices prior to the onset of applicable requirements.

Any collection device installed prior to the requirements of the rules will not be subject to the operational, monitoring, and/or recordkeeping requirements until the age of the initial waste placed in the affected area reaches five years old if active, or two years if closed or at final grade. Correspondence prepared by the EPA Region IV (letter dated May 31, 2007 for NSPS WWW landfill which is consistent with NSPS XXX/NESHAP AAAA requirements) regarding this matter has been included in Appendix D.

6.5 Monitoring During Collection Device Raising

During filling operations, any collection device may be extended (raised) periodically so that new refuse is not placed over the top of an existing device, thereby preventing access to the well. To maintain worker safety, vertical gas wells and horizontal access risers will be raised as needed in advance of waste filling operations. This may require the well to be raised more than 30 days before refuse is placed around the well. During this period, the well may be inaccessible for monitoring.

Due to the dangers associated with well raising, the landfill is requesting that raised collection devices be exempt from the monthly monitoring to eliminate potentially dangerous situations for monitoring personnel. Any times that a collection device is not monitored due to raising activities will be noted on the semi-annual reports.

6.6 Monitoring of Leachate Risers

Leachate collection and cleanout risers are operated at Riverbend for odor control purposes only. As such, if the leachate risers are connected to the gas collection system for any reason other to correct a surface emission monitoring exceedance, then the leachate riser will not be a NSPS XXX/NESHAP AAAA compliance point. These leachate risers can be connected to the GCCS when needed and can be disconnected at any time the landfill deems it necessary. When connected to the GCCS the devices are exempt from the NSPS standards for temperature as allowed in the July 27, 2012 exemption by ODEQ, which is included in Appendix D.

6.7 Operation of Near Surface Collectors for Cap Stability

The buildup of excessive landfill gas (LFG) pressure below the geomembranes can cause or contribute to cover system stability failure. Excessive pressure reduces the effective normal stress on the lower geomembrane interface and can cause veneer instability and/or cap system failure resulting in environmental impacts. Therefore, to protect the cover system surface collectors/vents maybe installed underneath the final cap. Given that near surface collectors/vents will not be installed in waste they are not considered part of the required GCCS and as such not subject to the monitoring and operating requirements of the applicable rules. Furthermore, given these collectors/vents are not installed in the waste they are not penetrations.

6.8 Surface Emission Monitoring (SEM)

6.8.1 Exclusion of Dangerous Areas from SEM requirements

Areas with steep slopes or other dangerous areas are excluded from the SEM requirements under the NSPS:

> **§60.763(d) & §63.1958(d)(1)** A surface monitoring design plan shall be developed...Areas with steep slopes or other dangerous areas may be excluded from surface testing.

The landfill is proposing to exclude the following dangerous areas from SEM:

a. Roads;

b. Working areas and/or the working face;

c. Truck traffic areas;

d. Steep and dangerous slopes;

e. Icy, snow covered, and/or muddy side slopes;

f. Areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate collection and removal systems.

6.8.2 Alternative Remedy for SEM events

The applicable rules require the landfill owner or operator to take corrective action to remedy any incidents of methane concentrations more than 500 ppm above background that are detected during SEM. The landfill will perform the initial SEM event and 10-day/1-month remonitoring events in accordance with the applicable rules. For SEM exceedances, corrective measures may include modifications to the GCCS other than the installation of additional LFG collection devices to meet the 120-day timeline unless an alternative timeline has been established. The following alternative remedies will be implemented to correct SEM exceedances within the 120-day timeline. These corrective actions may include, but are not limited to, one or more of the following measures:

a. Installation of, or upgrades to, conveyance and/or control equipment (e.g., larger flare, additional blowers, etc.).

b. Installation of a liquid management system in the extraction wells or sumps.

c. Installation/modification of other ancillary equipment (e.g., larger air compressor, additional air and condensate force main lines, etc.)

d. Installation of additional or replacement LFG collection devices;

e. Repair of the landfill cap to minimize LFG migration and/or air infiltration.

f. Repair or replace header valves.

Please note that this list is not intended to be exhaustive. Other actions that result in the remediation of an exceedance within the 120-day timeframe would also be covered under this alternative. Any enhancements made to the existing GCCS will be documented in the Semi-Annual Reports. Please note that the landfill will be proactively implementing this variance to ensure that exceedances are addressed as expeditiously as possible. If the GCCS cannot be brought back into compliance during the 120-day assessment period, the landfill will prepare an alternative compliance schedule for review and approval by the Administrator.

6.8.3 SEM for Closed Portions of the Landfill

The landfill is requesting that any portions of the landfill that have been certified closed or have been closed and capped in accordance applicable requirements be treated as a closed landfill for SEM events. These closed portions of the landfill will be monitored in accordance with the following section of the NSPS:

§60.766(f) & §63.1961(f) Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for the landfill to quarterly monitoring.

7 OPERATING CLARIFICATIONS

This section clarifies how this site will implement certain monitoring, recordkeeping and reporting obligations under NSPS XXX and NESHAP AAAA.

7.1 Alternative Timeline Request

60.765(a)(3) & §63.1960(a)(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with the rule the owner or operator must measure gauge pressure in the gas collection header applied to each individual well, monthly. If a positive pressure exists, action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under the rules. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(i) If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to the rules

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in the rule as part of the next annual report. The owner or operator must keep records according to the applicable requirements.

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator. The owner or operator must keep records according to the rules

60.765(a)(5) & §63.1960(a)(4) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must monitor each well monthly for temperature. If a well exceeds the operating parameter for temperature, action must be initiated to correct the exceedance within 5 calendar days. Any attempted corrective measure must not cause exceedances of other operational or performance standards. Note that the text below relates to the 145F limit of NESHAP AAAA.

(i) If a landfill gas temperature less than 145 degrees Fahrenheit cannot be achieved within 15 calendar days of the first measurement of landfill gas temperature greater than 145 degrees Fahrenheit, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 145 degrees was first measured. The owner or operator must keep records according to the rule.

(ii) If corrective actions cannot be fully implemented within 60 days following the elevated temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 145 degrees Fahrenheit. The owner or operator must submit the items listed in the applicable requirements as part of the next semiannual report. The owner or operator must keep records according to the rule.

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to the applicable requirements. The owner or operator must keep records according to the rule.

According to these requirements, the site is only required to submit the root cause analysis and corrective action analysis to the Administrator as part of an alternative timeline request for corrective actions that may take longer than 120 days from the initial exceedance date. This alternative timeline request with the root cause analysis and corrective action analysis must be submitted within 75 days after the initial exceedance. However, in accordance with requirements for the annual/semiannual report, if the exceedance takes more than 60 days to correct, the corrective action analysis should be included in the annual/semiannual report. As such, for landfill gas collection components that are remediated after 15 days but before 60 days of the initial exceedance, the root cause analysis and corrective action analysis will not be submitted to the Agency.

For remediation efforts that are corrected between 60-days and 120-days of the initial exceedance, the root cause and corrective action analyses will be submitted in the annual/semiannual report. If, however, remediation efforts are expected to require more than 120 days, an alternative timeline request will be submitted by day 75 and will include the root cause and corrective action analysis.

If the site receives no agency response within 30 calendar-days of submittal of the alternative timeline request to the Agency, the site will assume the alternative timeline is approved and the exceedance and corresponding alternative timeline will not be considered a reportable deviation in subsequent Title V reports.

7.2 Frequency to Update As-built Drawings

The landfill is required to keep an up-to-date readily accessible plot map showing each existing and planned collector. An up-to-date plot map is more commonly referred to as an as-built.

40 CFR 60.39f(d) & §63.1983(d) Except as provided in the rule, each owner or operator subject to the provisions of this subpart must keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.

(1) Each owner or operator subject to the provisions of this subpart must keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under the rule.

The as-built can only be generated for a landfill after construction projects that include upgrades and additions to the gas collection system are completed. Since there is no defined frequency for preparing/updating an as-built of the gas collection system, the landfill will update the as-built on an annual basis in years that changes or construction of the gas collection system are performed.

7.3 Establishment of a Higher Operating Value (HOV) for Temperature

As established in the December 15, 2000 correspondence from Riverbend to ODEQ, and subsequently approved by ODEQ in December 16, 2005 correspondence, the procedure to establish a higher operating value for temperature is as follows:

- Compare temperature, methane, and oxygen measurements to previous measurements and verify other parameters are in compliance, and have not deviated significantly from the previous readings (i.e. a significant decrease in methane may indicated consumption of fuel by combustion occurring inside the waste or consistently increasing temperatures may also indicate combustion).

- Make any necessary adjustment so the wellhead for percent methane or ambient air indicators.

- Measure and record percent carbon monoxide (CO) which is a byproduct of combustion. This will be performed to verify that there is no combustion of fuel occurring within the landfill in the effective zone of the LFG collection device in question. CO measurements will be collected utilizing a Draeger tube, which will be calibrated to read up to 1000 parts per million (ppm) of CO. These readings are expected to show some level of CO existing in the landfill gas resulting from natural decomposition of waste that creates methane.

- Once it has been verified that hazardous conditions due to above permitted well temperatures do not exist, Riverbend will continue to monitor and adjust the wellhead based on other parameters (vacuum, methane, etc.) and will continue to verify the absence of high CO readings on a quarterly basis as long as the well continues to operate above the permitted operating temperature of 55^{o}C or 131^{o}F or 145 ^{o}F under NESHAP AAAA.

7.4 Clarifications for Enhanced Monitoring

7.4.1 Timing for Initiation

The enhanced monitoring provisions of the NESHAP apply no later than September 27, 2021, unless the site has elected to meet the requirements of the NESHAP before that date. §63.1961(a)(5) states *"you must initiate enhanced monitoring at each well with a measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) as follows…(vii) The enhanced monitoring [in] this paragraph (a)(5) must begin 7 days after the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit)…"*

The following two clarifications are necessary for this new requirement:

First, the regulation as written requires a site to conduct enhanced monitoring after ANY occurrence of a temperature measurement in excess of 145°F. The preamble to the NESHAP includes the following statement: *"Enhanced monitoring begins 7 days after the first reading exceeding 145°F is recorded and continues until the measured wellhead operating temperature is 145°F or less, or an HOV is approved."*

However, the preamble goes on to state the following: *"Furthermore, the concern that the enhanced monitoring requirements would continue in perpetuity is unsubstantiated. First, landfills have up to 7 days to adjust the well to achieve a lower temperature before the enhanced monitoring requirements are triggered (40 CFR 63.1961(a)(5)(vii)). Second, the enhanced monitoring can stop once the well temperature drops back to 145°F or less."*

Additional monitoring and tuning can be performed during that 7-day period after the initial exceedance before enhanced monitoring activities are required. If an exceedance is corrected within that 7-day period, enhanced monitoring will not be initiated for that well.

Second, the regulation as written establishes a set date on the initiation of enhanced monitoring. The phrase "must begin 7 days after the first measurement" requires a site to start the corrective actions exactly 7 days after the measurement, even if that date falls on a holiday, or a weekend. The facility is proposing to initiate enhanced monitoring any time within 7 days of the initial measurement, unless the corrective actions taken within the first 7 days (as discussed above) reduce the well temperature to 145°F or less.

7.4.2 Down-Well Monitoring

The enhanced monitoring provisions of the NESHAP include the requirement to measure the temperature of the landfill gas every 10 vertical feet of the well on an annual basis for each wellhead with a gas temperature greater than 165°F. Based on the facility's understanding of this provision, the following provisions will apply for down-well monitoring:

- The requirement for annual down-well monitoring is understood to require that the monitoring be performed at least once at any time during the 12 months following the first temperature measurement greater than 165°F.
- The well will be shut off, and the wellhead removed, in order to perform down-well monitoring. Based on experience at other sites, down-well temperatures recorded while the well is operating are not representative due to heat transfer and mixing that occurs during gas extraction. Shutting off the well prior to monitoring also reduces risk to the technician performing the monitoring. Additional measures to ensure the technician's safety will also be implemented as needed.
- If conditions (i.e., temperature, gas quality, carbon monoxide, visual indicators, etc.) at the wellhead suggest that a subsurface fire is occurring, the well will be shut off in accordance with §60.763(b)(1) and §63.1958(b)(1). To prevent potential oxygen intrusion and unnecessary risk to personnel, the wellhead will not be removed, and down-well temperature will not be measured, until data indicate the subsurface fire is no longer occurring. In these cases, the status of the affected well will be reported in the semi-annual report in accordance with §63.1981(h)(8).
- The liquid level in the well will be measured prior to temperature monitoring. To minimize the potential for damage to the temperature monitoring probe, the down-well temperature monitoring will terminate above the liquid level.

7.4.3 Carbon Monoxide Measurement

The NESHAP requires measurement of carbon monoxide (CO) during enhanced monitoring at affected wells using EPA Method 10 (§63.1961(a)(5)(vi)(A) and (B)). EPA Method 10 is a field method principally developed for measuring carbon monoxide from stationary combustion units by extracting continuous samples from an exhaust stack. Use of this method at a landfill gas extraction well operating under vacuum presents numerous technical issues, and its use is not suitable for field or laboratory testing of carbon monoxide concentrations in raw landfill gas.

At the time of this plan preparation, EPA has recently approved three alternative methods for CO monitoring:

- Alt-143 ALTERNATIVE METHOD FOR THE FIELD DETERMINATION OF CARBON MONOXIDE CONCENTRATION IN LANDFILL GAS WELLHEADS UNDER 40 CFR 63, SUBPART AAAA
- Alt-144 DETERMINATION OF CARBON MONOXIDE CONCENTRATION IN LANDFILL GAS WELLHEADS – GAS CHROMATOGRAPHIC MEASUREMENT (FID)
- Alt-145 DETERMINATION OF CARBON MONOXIDE CONCENTRATION IN LANDFILL GAS WELLHEADS – GAS CHROMATOGRAPHIC MEASUREMENT (TCD)

RLC will utilize one of these methods or another EPA approved alternative if CO monitoring is required under AAAA.

7.5 Certification of Prior Reports

As described in §63.1981, the NESHAP does not require re-submittal of the following reports if they were previously submitted under 40 CFR part 60, subpart WWW; 40 CFR part 60, subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR part 60, subpart Cc or 40 CFR part 60, subpart Cf:

- Design capacity report;
- Amended design capacity report;
- Initial NMOC emission rate report;
- Initial or revised collection and control system design plan;
- Closure report;
- Equipment removal report; or
- Initial performance test report.

§63.1981 also notes, however, that "*[Y]ou must include a statement certifying prior submission of the respective report(s) and the date of submittal in the first semi-annual report required in this section.*" This certification will be included, as applicable, in the first semi-annual report submitted after September 27, 2021. If the facility elects to begin complying with the NESHAP before that date, the certification will be included in the first semi-annual report due after the date the facility began complying with the NESHAP provisions.

APPENDIX A

CALCULATIONS

APPENDIX A-1:

LANDFILL GAS GENERATION RATE MODELING

LANDFILL GAS GENERATION AND RECOVERY

NSPS requires that the k and L_o kinetic factors be those published by the most recent compilation of Air Pollutant Emission Factors (AP-42) or other site-specific values demonstrated to be appropriate by the Administrator. For this GCCS Design Plan, the United States Environmental Protection Agency's (US EPA) Landfill Gas Emission Model (LandGEM) version 3.02 is being used to estimate landfill gas generation.

Using both historical and projected annual waste disposal rates and default AP-42 k and L_o factors, the LandGEM model was used to project maximum landfill gas generation rates. A collection efficiency factor of 75 percent was then applied to this generation rate assuming that the final collection system will capture 75 percent of all landfill gas generated. This percentage is matches the percentage substantiated by AP-42 as being within the typical range of collection efficiency for landfills since the final cover will contain geosynthetics which should hold more gas in for collection. The remaining 25% will be considered fugitive emissions.

Historical disposal rates were obtained from landfill records. Projected future disposal rates were developed based on the following assumptions prepared with input from landfill personnel:

- Historical tonnages from 1982 to 2016 obtained from waste in place records and the 10/5/17 XXX Initial Design Capacity and NMOC Emission Rate Report.
- Historical tonnages for 2017-2020 based on waste records retained at the facility.
- Assumption of 57,200 tons of degradable waste projected to be disposed from 2021 through closure.
- Anticipated closure in 2029 based on current waste projections.

The historic and projected future disposal rates developed for the landfill are shown in the model results included in this Appendix. Based on the model results, the following conclusions can be drawn:

- The projected maximum landfill gas generation rate is approximately 3,445 scfm (standard cubic feet per minute), which occurred in 2017 due to a reduction in filling.
- Based on the model inputs the gas generation is relatively steady through to closure. Riverbend is projected to collect 75% of the LFG generated or 2,584 scfm.
- However, to conservatively size header/lateral conveyance piping a factor of safety of 1.2 has been applied; therefore, a flow rate of 3,100 scfm is used to size the piping system.

It is important to note that these design values are conservative, as flows measured since 2017 have been less than the modeled value assuming a 75% collection efficiency. This is likely due to overestimation by the LandGEM model as well as site specific conditions at Riverbend. Through a Title V permit modification in 2020, Riverbend has obtained approval from ODEQ to use different LandGEM model input parameters to periodically estimate landfill gas generation potential. These parameters are based on actual conditions at at Riverbend and suggest lower peak flows than those used for the design basis in this Plan, again reinforcing that the design is conservative.

LANDGEM SUMMARY FOR FINAL BUILDOUT
RIVERBEND LANDFILL CO. - McMINNVILLE, OREGON

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation Rates (cfm)	LFG Collection Rates (cfm)
1982	200,000	0	181,437	0	0	0
1983	200,000	200,000	181,437	181,437	96	72
1984	200,000	400,000	181,437	362,874	188	141
1985	200,000	600,000	181,437	544,311	277	208
1986	200,000	800,000	181,437	725,748	362	271
1987	200,000	1,000,000	181,437	907,185	444	333
1988	200,000	1,200,000	181,437	1,088,622	522	392
1989	200,000	1,400,000	181,437	1,270,059	598	448
1990	200,000	1,600,000	181,437	1,451,496	670	503
1991	200,000	1,800,000	181,437	1,632,933	740	555
1992	194,688	2,000,000	176,618	1,814,369	807	605
1993	203,785	2,194,688	184,871	1,990,987	869	652
1994	188,618	2,398,473	171,111	2,175,858	933	699
1995	292,690	2,587,091	265,524	2,346,969	987	740
1996	329,798	2,879,781	299,188	2,612,493	1,088	816
1997	412,899	3,209,579	374,576	2,911,681	1,204	903
1998	468,998	3,622,478	425,468	3,286,257	1,355	1,016
1999	301,671	4,091,476	273,671	3,711,725	1,527	1,145
2000	348,588	4,393,147	316,234	3,985,396	1,612	1,209
2001	357,667	4,741,735	324,470	4,301,630	1,716	1,287
2002	405,381	5,099,402	367,755	4,626,100	1,820	1,365
2003	403,950	5,504,783	366,457	4,993,855	1,944	1,458
2004	435,536	5,908,733	395,112	5,360,312	2,061	1,546
2005	454,718	6,344,269	412,513	5,755,424	2,189	1,642
2006	505,297	6,798,987	458,398	6,167,937	2,322	1,741
2007	533,137	7,304,284	483,654	6,626,335	2,473	1,855
2008	495,507	7,837,421	449,516	7,109,989	2,632	1,974
2009	440,705	8,332,928	399,801	7,559,505	2,767	2,075
2010	459,916	8,773,633	417,229	7,959,306	2,870	2,152
2011	443,310	9,233,549	402,164	8,376,535	2,978	2,234
2012	422,124	9,676,859	382,944	8,778,699	3,074	2,306
2013	425,021	10,098,983	385,573	9,161,643	3,156	2,367
2014	389,975	10,524,004	353,779	9,547,216	3,236	2,427
2015	400,640	10,913,979	363,454	9,900,995	3,297	2,473
2016	452,289	11,314,619	410,310	10,264,450	3,360	2,520
2017	154,558	11,766,908	140,213	10,674,759	3,445	2,584
2018	86,983	11,921,466	78,910	10,814,972	3,384	2,538
2019	45,169	12,008,449	40,977	10,893,882	3,293	2,470
2020	55,520	12,053,618	50,367	10,934,858	3,186	2,389
2021	57,200	12,109,138	51,891	10,985,225	3,088	2,316
2022	57,200	12,166,338	51,891	11,037,116	2,994	2,245
2023	57,200	12,223,538	51,891	11,089,007	2,904	2,178
2024	57,200	12,280,738	51,891	11,140,898	2,818	2,113
2025	57,200	12,337,938	51,891	11,192,789	2,735	2,051
2026	57,200	12,395,138	51,891	11,244,680	2,655	1,991
2027	57,200	12,452,338	51,891	11,296,571	2,578	1,934
2028	57,200	12,509,538	51,891	11,348,462	2,504	1,878

LANDGEM SUMMARY FOR FINAL BUILDOUT
RIVERBEND LANDFILL CO. - McMINNVILLE, OREGON

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation Rates (cfm)	LFG Collection Rates (cfm)
2029	1,031	12,566,738	935	11,400,353	2,434	1,825
2030		12,567,769	0	11,401,288	2,339	1,754

MAX GENERATED LFG = 3,445 scfm in 2017
MAX COLLECTED LFG = 2,584 scfm in 2017 assuming a collection efficiency cited below
LFG Rate for Calculations = 3,101 scfm (assumes a factor of safety of 1.2)

NMOC Concentration in LFG: 595 ppmv (AP-42 Section 2.4)
Methane Content in LFG: 50% (AP-42)
Collection Efficiency: 75% (AP-42)
Decay Rate Constant: 0.04 (AP-42)
Ultimate Methane Recovery Rate: 3,203.7 ft3/ton (AP-42)
100 cu m/Mg

NOTES:
1.) Tonnages from 1982 to 2016 obtained from the 10/5/17 XXX Initial Design Capacity and NMOC Emission Rate Report
2.) 2017-2021 tonnage from Riverbend based on MSW and C&D received at the site
3.) Closure year and projected annual filling rates as provided by Riverbend.

APPENDIX A-2:
CONDENSATE GENERATION CALCULATIONS

CONDENSATE GENERATION

The condensate will flow to one of several condensate sumps (i.e. engineered low points) throughout the landfill gas collection and control system. Appendix B provides a typical condensate sump detail. The pumps within each condensate sump should be sized accordingly for the portion of the overall condensate flow that each sump will likely be required to accommodate. For early stages of design, the pumps should be slightly oversized until actual field generation quantities can be examined against the values calculated here. In addition to designing the ultimate pump capacity, each pump must be checked to assure that it can pump to the elevation required and pump against the anticipated friction losses in the discharge pipe. It is not believed that liquid management will have an impact on the landfill gas collection and control system since collected condensate should, in theory, slightly decrease as moisture is removed from the landfill.

Included in this Appendix is a summary of the calculations that were utilized to determine the potential condensate generation from Riverbend. The condensate generation is dependent on the temperature of the landfill gas at the blower inlet. A range of potential blower inlet temperatures were utilized to estimate condensate generation rates. The highest potential condensate generation will occur when the blower inlet temperatures is the lowest, causing the largest temperature drop in the collection system piping. With a minimum blower inlet temperature of 30^{o}F, the potential maximum condensate generation rate is approximately 1,444 gallons per day. For the complete range of potential condensate generations rates refer to the attached summary sheet.

APPENDIX A-2. CONDENSATE GENERATION CALCULATIONS
RIVERBEND LANDFILL CO. - McMINNVILLE, OREGON

CLIENT	PROJECT		JOB NO.
Riverbend Landfill Co.	GCCS Design Plan - XXX		
SUBJECT	BY		DATE
CONDENSATE GENERATION CALCULATIONS	Lindsey Kennelly		7/5/2018
	CHECKED		DATE

OBJECTIVE: Calculate the condensate generated at maximum collection rates.

Assumptions/Design Criteria:

1.) Relative to the header/lateral piping network, the gas is warmest at the extraction wellhead.
2.) The temperature of the LFG being transported through the pipe network will tend to stabilize at or near the ground temperature.
3.) The LFG temperature at the blower inlet is a function of the distance traveled in buried pipe and the thermal conductivity of buried pipe.
4.) Though work at the blower provides minimal compression of the LFG, additional condensate generated due to the heat of compression is not expected.
5.) No correction for gas gravity is included in this condensate generation calculation.

Condensate Generation Formula:

$$CG = \frac{Q \times (WHD_{WVC} - BI_{WVC}) \times 1{,}440}{8.34 \times 10^6}$$

CG = Estimated Condensate Generation (GPD)
Q = Total Site Design LFG Flow Rate at Buildout (scfm)
WHD_{WVC} = Water Vapor Content of LFG at the Wellhead (lbm/MMscf)
BI_{WVC} = Water Vapor Content of LFG at the Blower Inlet (lbm/MMscf)
r_{water} = 8.34 lb/gal
Time = 1,440 minutes/day

Site Assumptions

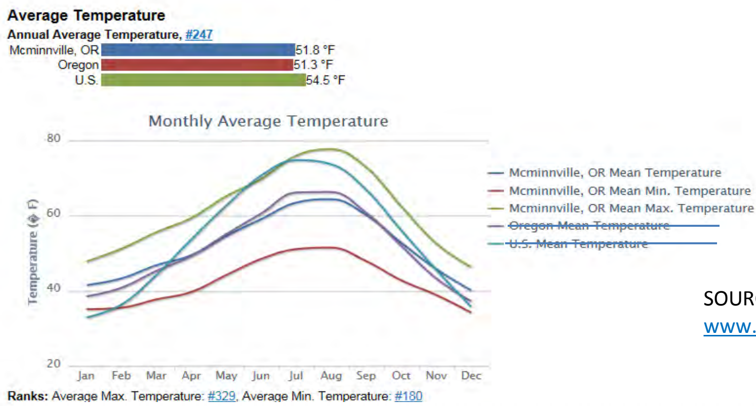
WHD_{WVC} = 3,000 lbm/MMscf at 100^{o}F, which is the typicall gas temperature at the wellhead
Q = 3,100 scfm
Avg. Wellhead Temp = 100 °F

Blower Inlet Temperature (°F)	BI_{WVC} (lbm/MMscf)	Condensate Generated (gal/day)
30	300	1,444
40	400	1,391
60	800	1,177
70	1,000	1,070
80	1,600	749
90	2,200	428

MAXIMUM CONDENSATE GENERATION RATE = 1,444 gal/day

APPENDIX A-2. CONDENSATE GENERATION CALCULATIONS
RIVERBEND LANDFILL CO. - McMINNVILLE, OREGON

CLIENT	PROJECT		JOB NO.
Riverbend Landfill Co.	GCCS Design Plan - XXX		
SUBJECT	BY		DATE
CONDENSATE GENERATION CALCULATIONS	Lindsey Kennelly		7/5/2018
	CHECKED		DATE



SOURCE:
www.USA.com

Handbook of Natural Gas Transmission and Processing

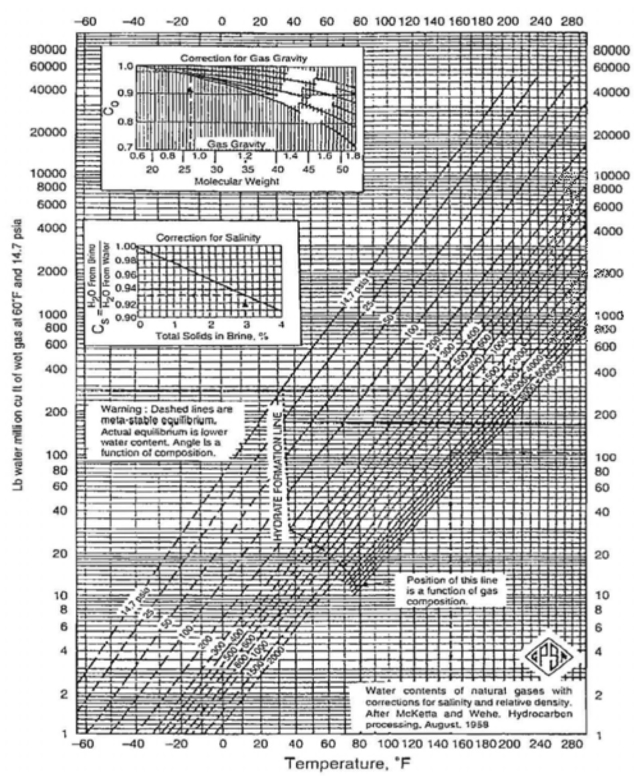


Figure 9-1. McKetta and Wehe (1958) pressure–temperature correlation (GPSA, 1998).

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APPENDIX A-3:

PRESSURE DROP ANAYLSIS RESULTS

PRESSURE DROP ANALYSIS

A hydraulic analysis was performed on the proposed pipe network to verify that it could adequately handle the LFG that may be generated from the entire permitted waste footprint. To ensure that the proposed pipe network was adequately designed to convey the LFG at full build-out and the interim phases of construction, the hydraulic analysis was performed on the final build-out GCCS network and on the cross-over loops at interim conditions. This evaluation was performed using the PIPE-FLO Professional (PIPE-FLO) model.

PIPE-FLO was developed by Engineered Software, Inc. and is modeling program for fluid distribution systems. The program uses the Darcy-Weisbach equation for head losses related to incompressible flow and the Ideal Gas Law for pressure-temperature-density relationships. The program balances the wellfield and computes variations in the friction factor with changes in temperature more rigorously than manual calculations.

In order to operate the PIPE-FLO model the following information must be obtained:

- Pipeline inside diameter (ID) (adjusted by user to meet maximum allowable velocities and friction losses);
- Pipeline length (measured from layout map);
- Roughness within the pipeline (150, based on smooth HDPE pipe);
- Landfill gas flow rate into the system at each extraction well or node;
- Landfill gas operating temperature (T = 110 °F);
- Density of landfill gas (0.03292 lb/ft^3);
- Specific heat capacity (0.5434 BTU/lb °F);
- Ratio of specific heats ($k = C_p/C_v = 1.298$);
- Viscosity of landfill gas (μ = 0.01166 cP); and
- Acceleration of gravity constant ($g_C = 32.17\ lb_M*ft/lb_F*sec^2$).

The modeled landfill gas flow rates are as follows:

- The peak LFG generation rate was calculated to be 3,445 scfm; however since the landfill is projected to only collect 75% of the LFG generated 2,584 scfm would be an accurate design basis for the pipe sizing calculations.
- To ensure that pipe sizing is adequate, a factor of safety of 1.2 has been applied, bringing the design flow for the GCCS to 3,100 scfm. Based on the aforementioned information and general understanding of landfill development, the total LFG flow is divided into varying amounts at each extraction wellhead over the life of the site.

PIPE-FLO allows the user to input the piping network to scale in an AutoCAD format. Once all of the required information is in the program, the user can begin to evaluate the GCCS. Analysis of the GCCS is an iterative process in which the initial design must be based on the engineering judgment of the user. Once the results of the initial model are reviewed, the iterative process begins by balancing the piping network to control LFG velocity, pressure drop, and pipe diameter for various segments of the GCCS.

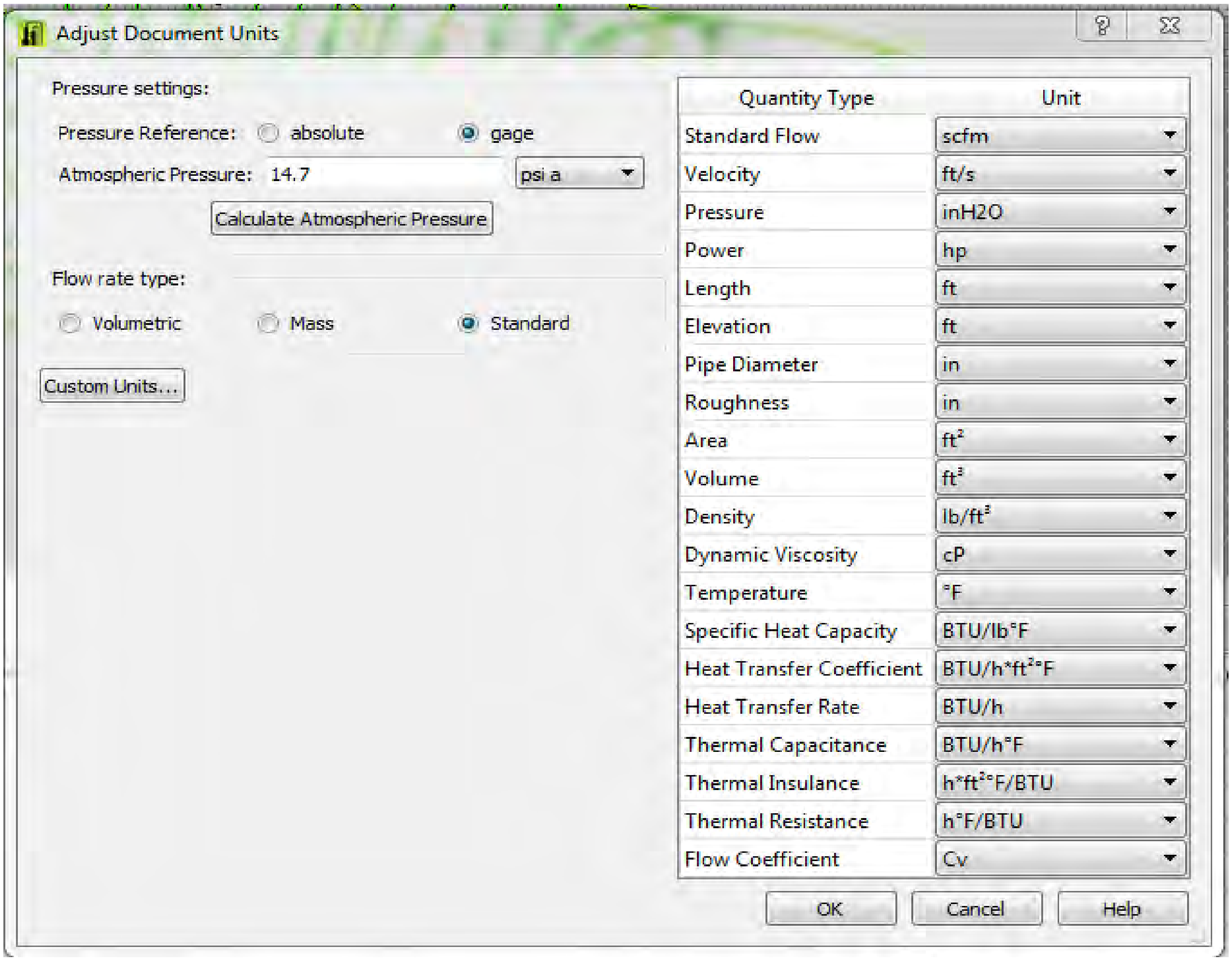
The initial flow rates and their input locations remain constant throughout this process. Typically, the main factor adjusted for each iteration is the pipe diameter. The inside pipe diameter establishes the LFG velocity and pressure drop in each pipe segment. Once the velocities in the system piping and the vacuum pressure remaining at the furthest node meet design criteria, the user may proceed with finalizing the GCCS design.

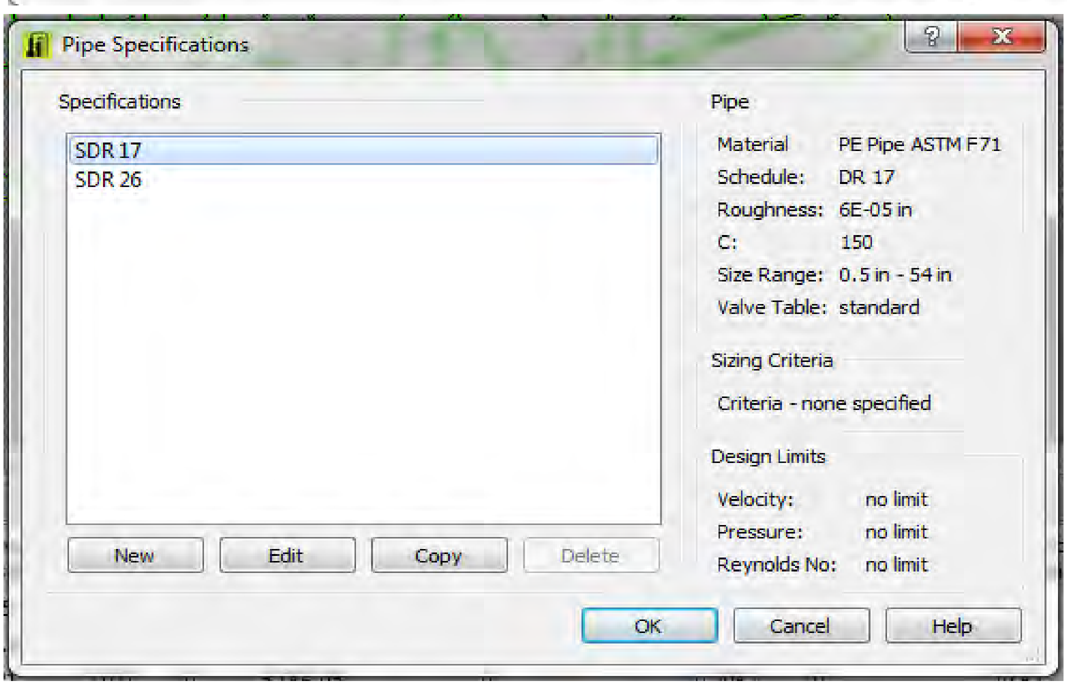
The design criteria for used the header system were:

Maximum Pressure Drop	1-inch of water column per 100 feet of pipeline
Minimum Vacuum at Most Remote Well	15 inches of water column

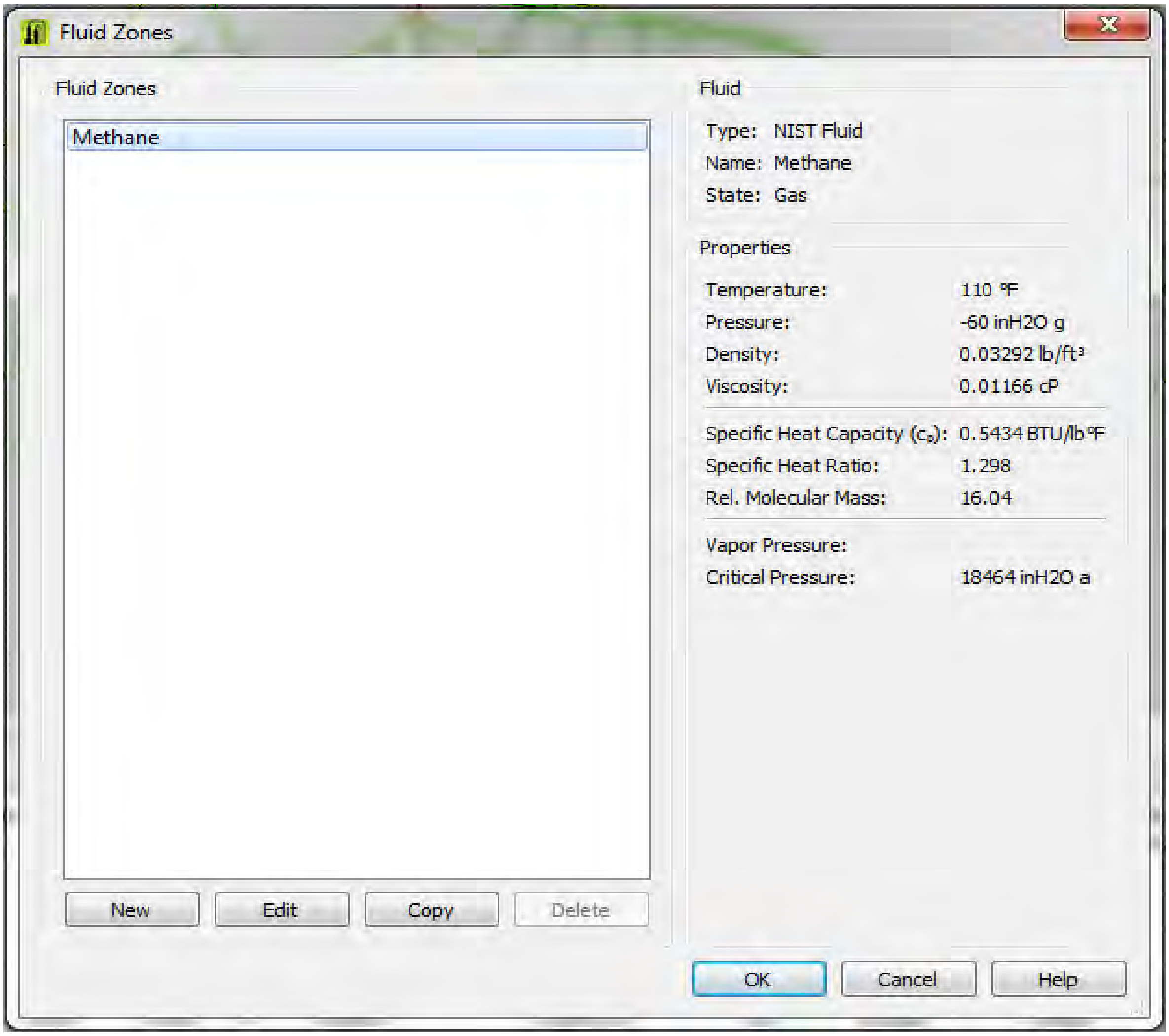
The PIPE-FLO output files show that there is a total system pressure drop of approximately 15 inches of water column from the landfill blower (which is assumed to have a vacuum of 60 inches of water column) to the most remote well such that a minimum of 15 inches of water column of vacuum is available at the most remote well.

Attachment A-3: PipeFLO Inputs
Riverbend Landfill - McMinneville, OR





Attachment A-3: PipeFLO Inputs
Riverbend Landfill - McMinneville, OR



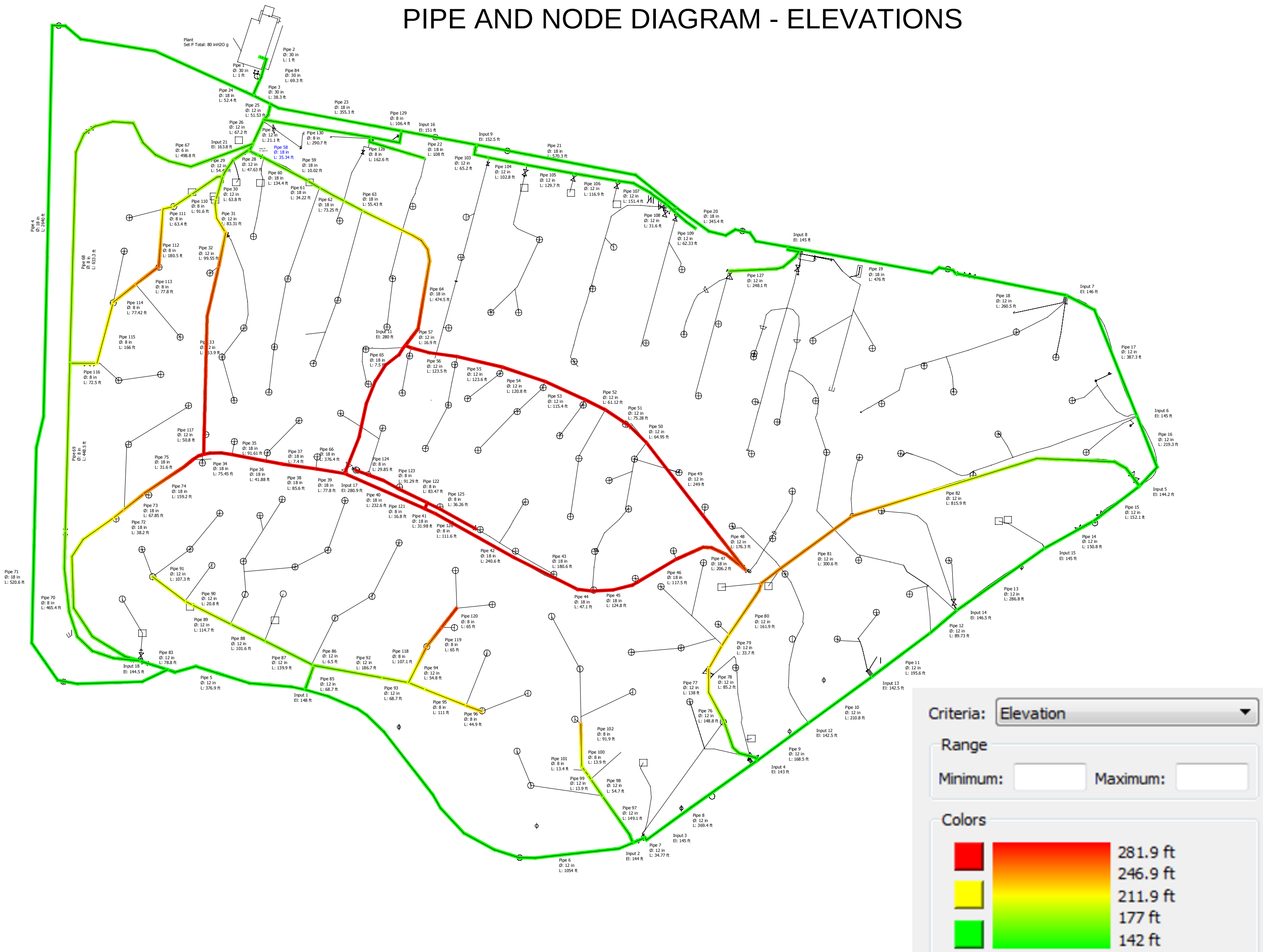
Appendix A-3 Pressure Drop Analysis Results (PipeFLO Output)
Riverbend Landfill - McMinneville, Oregon

Name	Length (ft)	Velocity (ft/s)	dp ("H2O)	From	From Elevation (ft)	From Pressure (" H2O)	To	To Elevation (ft)	To Pressure (" H2O)	Minor Losses
Pipe 26	67.2	40.11	0.1620	Node 68	160.8	-79.41	Node 22	158	-79.58	--
Pipe 27	21.1	38.62	0.0997	Input 21	163.8	-79.31	Node 68	160.8	-79.41	0.4733
Pipe 24	52.4	38.49	0.1862	Input 22	150	-79.78	Node 2	150	-79.96	0.7373
Pipe 25	51.53	37.23	0.2001	Node 22	158	-79.58	Input 22	150	-79.78	0.9992
Pipe 5	376.9	22.56	0.4099	Input 1	148	-78.72	Node 3	142	-79.13	1.893
Pipe 23	355.3	19.81	0.1784	Input 16	151	-79.6	Input 22	150	-79.78	0.2458
Pipe 18	260.5	19.45	0.1772	Input 7	146	-78.93	Node 16	144	-79.1	--
Pipe 1	1	18.81	0.0002	Sizing Pump 1	150	80	Plant	150	80	--
Pipe 2	1	18.81	0.0002	Node 78	150	-80	Sizing Pump 1	150	-80	--
Pipe 84	69.3	18.81	0.0278	Node 1	150	-79.97	Node 78	150	-80	0.3349
Pipe 3	38.3	18.81	0.0093	Node 2	150	-79.96	Node 1	150	-79.97	--
Pipe 22	108	17.18	0.0726	Input 9	152.5	-79.53	Input 16	151	-79.6	1.475
Pipe 17	387.3	15.9	0.2071	Input 6	145	-78.72	Input 7	146	-78.93	0.2104
Pipe 4	2640	13.75	0.8281	Node 3	142	-79.13	Node 2	150	-79.96	5.825
Pipe 21	570.3	13.02	0.2016	Node 18	146	-79.32	Input 9	152.5	-79.53	1.917
Pipe 20	345.4	13.02	0.1249	Input 8	145	-79.2	Node 18	146	-79.32	2.458
Pipe 16	219.3	12.94	0.0879	Input 5	144.2	-78.63	Input 6	145	-78.72	0.3944
Pipe 19	476	9.757	0.0943	Node 16	144	-79.1	Input 8	145	-79.2	2.507
Pipe 64	474.5	8.019	-0.4680	Input 11	280	-79.91	Node 56	192.5	-79.45	0.7865
Pipe 63	55.43	8.019	-0.0186	Node 56	192.5	-79.45	Node 57	188.4	-79.43	--
Pipe 59	10.02	8.019	-0.0021	Node 58	166.9	-79.32	Node 59	166.4	-79.32	--
Pipe 58	35.34	8.019	-0.0077	Node 59	166.4	-79.32	Input 21	163.8	-79.31	0.7373
Pipe 62	73.25	8.019	-0.0295	Node 57	188.4	-79.43	Node 76	182.2	-79.4	--
Pipe 61	34.22	8.019	-0.0127	Node 76	182.2	-79.4	Node 77	179.5	-79.39	--
Pipe 60	134.4	8.019	-0.0615	Node 77	179.5	-79.39	Node 58	166.9	-79.32	--
Pipe 6	1054	7.768	0.1776	Input 2	144	-78.55	Input 1	148	-78.72	0.6837
Pipe 14	150.8	7.475	0.0223	Input 15	145	-78.59	Node 12	144	-78.61	1.578
Pipe 15	152.1	7.475	0.0239	Node 12	144	-78.61	Input 5	144.2	-78.63	0.4733
Pipe 13	286.8	6.292	0.0193	Input 14	146.5	-78.57	Input 15	145	-78.59	--
Pipe 129	106.4	6.276	0.0110	Node 122	152	-79.59	Input 16	151	-79.6	--
Pipe 130	290.7	6.276	0.0107	Node 22	158	-79.58	Node 122	152	-79.59	--
Pipe 67	498.8	5.502	-0.0129	Node 69	178.9	-79.43	Node 68	160.8	-79.41	2.317
Pipe 28	47.63	5.483	-0.0512	Node 73	173.2	-79.37	Input 21	163.8	-79.31	0.263
Pipe 29	54.45	5.483	-0.0565	Node 23	183.5	-79.42	Node 73	173.2	-79.37	0.2104
Pipe 117	50.8	5.474	0.0069	Input 20	280	-79.93	Node 110	280.5	-79.94	--
Pipe 33	453.9	5.474	-0.1454	Node 110	280.5	-79.94	Node 75	250	-79.8	0.2104
Pipe 30	63.8	5.474	-0.0924	Node 74	200	-79.51	Node 23	183.5	-79.42	0.263
Pipe 31	83.31	5.474	-0.1289	Node 24	223	-79.64	Node 74	200	-79.51	0.4207
Pipe 32	99.55	5.474	-0.1521	Node 75	250	-79.8	Node 24	223	-79.64	0.2104
Pipe 34	75.45	5.339	0.0010	Node 31	280.8	-79.93	Input 20	280	-79.93	0.7373
Pipe 35	91.61	5.339	0.0042	Node 32	280.8	-79.93	Node 31	280.8	-79.93	--
Pipe 36	41.88	5.339	0.0026	Node 33	280.7	-79.93	Node 32	280.8	-79.93	--
Pipe 37	7.4	5.339	0.0004	Node 34	280.7	-79.93	Node 33	280.7	-79.93	--
Pipe 38	85.6	5.339	0.0035	Node 35	280.8	-79.92	Node 34	280.7	-79.93	--
Pipe 39	77.8	5.339	0.0031	Input 17	280.9	-79.92	Node 35	280.8	-79.92	--
Pipe 83	78.8	4.856	-0.0076	Input 18	144.5	-79.14	Node 3	142	-79.13	1.052
Pipe 76	148.8	4.28	0.2290	Input 4	143	-78.54	Node 62	179.9	-78.76	1.42
Pipe 78	85.2	4.28	0.0173	Node 63	218.5	-79	Node 64	220.6	-79.02	0.2104
Pipe 77	138	4.28	0.2361	Node 62	179.9	-78.76	Node 63	218.5	-79	0.2104
Pipe 79	33.7	4.28	0.0016	Node 64	220.6	-79.02	Node 65	220.6	-79.02	--
Pipe 80	161.9	4.28	0.1260	Node 65	220.6	-79.02	Node 66	240.4	-79.15	0.2104
Pipe 81	300.6	4.28	0.0088	Node 66	240.4	-79.15	Node 67	239.3	-79.15	0.2104
Pipe 82	815.9	4.28	-0.5216	Node 67	239.3	-79.15	Input 5	144.2	-78.63	1.21
Pipe 11	195.6	3.334	0.0271	Input 13	142.5	-78.53	Node 9	146	-78.56	--
Pipe 12	89.73	3.334	0.0059	Node 9	146	-78.56	Input 14	146.5	-78.57	--
Pipe 69	448.5	3.263	0.0745	Node 71	180	-79.38	Node 70	188.5	-79.45	1.139
Pipe 70	465.4	3.263	0.2353	Input 18	144.5	-79.14	Node 71	180	-79.38	0.911
Pipe 68	633.3	3.245	-0.0247	Node 70	188.5	-79.45	Node 69	178.9	-79.43	0.4555
Pipe 7	34.77	3.035	-0.0046	Input 3	145	-78.55	Input 2	144	-78.55	0.3944
Pipe 71	520.6	2.592	-0.4255	Node 27	217.5	-79.57	Input 18	144.5	-79.14	0.9831
Pipe 72	38.2	2.592	-0.0400	Input 19	224.3	-79.61	Node 27	217.5	-79.57	--
Pipe 73	67.85	2.592	-0.0923	Node 29	240	-79.7	Input 19	224.3	-79.61	--
Pipe 74	159.2	2.592	-0.2282	Node 30	278.8	-79.93	Node 29	240	-79.7	--
Pipe 75	31.6	2.592	-0.0061	Input 20	280	-79.93	Node 30	278.8	-79.93	0.7373
Pipe 8	369.4	1.852	0.0164	Input 4	143	-78.54	Input 3	145	-78.55	0.6574
Pipe 10	210.8	1.559	0.0018	Input 12	142.5	-78.53	Input 13	142.5	-78.53	--
Pipe 66	376.4	0.7622	-0.0039	Input 17	280.9	-79.92	Node 55	280.1	-79.92	0.639
Pipe 65	7.5	0.7622	-0.0008	Node 55	280.1	-79.92	Input 11	280	-79.91	--
Pipe 49	249	0.2644	-0.0072	Node 45	281.9	-79.93	Node 46	280.7	-79.92	--
Pipe 48	176.3	0.2644	0.1485	Node 44	256.9	-79.78	Node 45	281.9	-79.93	--
Pipe 50	64.95	0.2644	-0.0028	Node 46	280.7	-79.92	Node 47	280.2	-79.92	--
Pipe 51	75.28	0.2644	-0.0011	Node 47	280.2	-79.92	Node 48	280	-79.91	0.2104
Pipe 52	61.12	0.2644	0.0006	Node 48	280	-79.91	Node 49	280.1	-79.92	--
Pipe 53	115.4	0.2644	0.0024	Node 49	280.1	-79.92	Node 50	280.5	-79.92	--
Pipe 54	120.8	0.2644	-0.0020	Node 50	280.5	-79.92	Node 51	280.2	-79.92	--
Pipe 55	123.6	0.2644	-0.0004	Node 51	280.2	-79.92	Node 52	280.1	-79.92	--
Pipe 56	123.5	0.2644	-0.0001	Node 52	280.1	-79.92	Node 53	280.1	-79.92	--
Pipe 57	16.9	0.2644	-0.0003	Node 53	280.1	-79.92	Input 11	280	-79.91	0.7889

Appendix A-3 Pressure Drop Analysis Results (PipeFLO Output)
Riverbend Landfill - McMinneville, Oregon

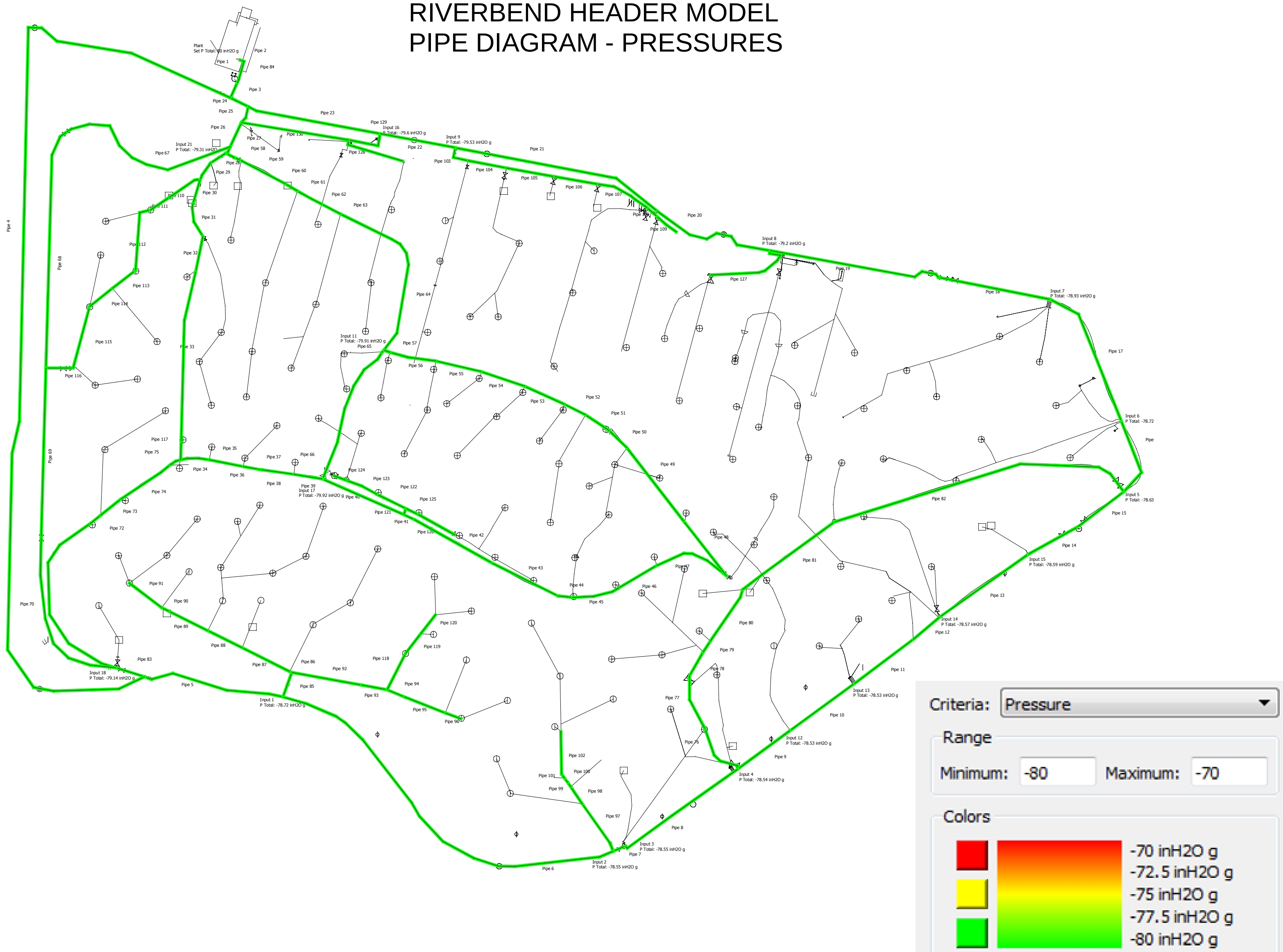
Name	Length (ft)	Velocity (ft/s)	dp ("H2O)	From	From Elevation (ft)	From Pressure (" H2O)	To	To Elevation (ft)	To Pressure (" H2O)	Minor Losses
Pipe 9	168.5	0.2158	0.0030	Input 12	142.5	-78.53	Input 4	143	-78.54	0.263
Pipe 40	232.6	0.1327	-0.0047	Input 17	280.9	-79.92	Node 37	280.1	-79.91	0.9831
Pipe 41	31.98	0.1327	-0.0001	Node 37	280.1	-79.91	Node 38	280.1	-79.91	0.2458
Pipe 42	240.6	0.1327	0.0001	Node 38	280.1	-79.91	Node 39	280.1	-79.91	--
Pipe 43	180.6	0.1327	0.0037	Node 39	280.1	-79.91	Node 40	280.7	-79.92	--
Pipe 44	47.1	0.1327	0.0016	Node 40	280.7	-79.92	Node 41	281	-79.92	0.1966
Pipe 46	117.5	0.1327	0.0005	Node 42	280.6	-79.92	Node 43	280.7	-79.92	--
Pipe 47	206.2	0.1327	-0.1412	Node 43	280.7	-79.92	Node 44	256.9	-79.78	0.3933
Pipe 45	124.8	0.1327	-0.0024	Node 41	281	-79.92	Node 42	280.6	-79.92	--
Pipe 116	72.5	0.01821	0.1157	Node 70	188.5	-79.45	Node 109	208	-79.57	0.427
Pipe 115	166	0.01821	0.0556	Node 109	208	-79.57	Node 108	217.4	-79.62	0.2277
Pipe 114	77.42	0.01821	0.0969	Node 108	217.4	-79.62	Node 107	233.7	-79.72	0.2277
Pipe 113	77.8	0.01821	0.0968	Node 107	233.7	-79.72	Node 106	250	-79.82	0.2277
Pipe 112	180.5	0.01821	-0.2693	Node 106	250	-79.82	Node 105	204.6	-79.55	0.6548
Pipe 111	63.4	0.01821	-0.0583	Node 105	204.6	-79.55	Node 104	194.8	-79.49	--
Pipe 110	91.6	0.01821	-0.0671	Node 104	194.8	-79.49	Node 23	183.5	-79.42	1.281
Pipe 85	68.7	0	0.1492	Input 1	148	-78.72	Node 79	173.1	-78.87	0.7889
Pipe 86	6.5	0	0.0027	Node 79	173.1	-78.87	Node 80	173.6	-78.88	0.7889
Pipe 87	139.9	0	0.0485	Node 80	173.6	-78.88	Node 81	181.8	-78.93	--
Pipe 88	101.6	0	0.0543	Node 81	181.8	-78.93	Node 82	190.9	-78.98	--
Pipe 89	114.7	0	0.0672	Node 82	190.9	-78.98	Node 83	202.2	-79.05	--
Pipe 90	20.8	0	0.0122	Node 83	202.2	-79.05	Node 84	204.3	-79.06	0.2104
Pipe 91	107.3	0	-0.0216	Node 84	204.3	-79.06	Node 85	200.6	-79.04	--
Pipe 92	186.7	0	0.1062	Node 79	173.1	-78.87	Node 86	191	-78.98	0.7889
Pipe 93	68.7	0	0.0496	Node 86	191	-78.98	Node 87	199.4	-79.03	--
Pipe 94	54.8	0	0.0350	Node 87	199.4	-79.03	Node 88	205.3	-79.06	0.263
Pipe 95	111	0	0.0754	Node 88	205.3	-79.06	Node 89	218	-79.14	--
Pipe 96	44.9	0	0.0356	Node 89	218	-79.14	Node 90	224	-79.18	--
Pipe 97	149.1	0	0.1834	Input 2	144	-78.55	Node 91	174.9	-78.73	0.7889
Pipe 98	54.7	0	0.0851	Node 91	174.9	-78.73	Node 92	189.2	-78.82	--
Pipe 99	13.9	0	0.0226	Node 92	189.2	-78.82	Node 93	193	-78.84	--
Pipe 100	13.9	0	0.0205	Node 93	193	-78.84	Node 94	196.5	-78.86	--
Pipe 101	13.4	0	0.0208	Node 94	196.5	-78.86	Node 95	200	-78.88	0.2277
Pipe 102	91.9	0	0.1899	Node 95	200	-78.88	Node 96	232	-79.07	0.2277
Pipe 103	65.2	0	0.0148	Input 9	152.5	-79.53	Node 97	155	-79.54	1.183
Pipe 104	102.8	0	-0.0237	Node 97	155	-79.54	Node 98	151	-79.52	--
Pipe 105	129.7	0	0.0000	Node 98	151	-79.52	Node 99	151	-79.52	--
Pipe 106	116.9	0	-0.0059	Node 99	151	-79.52	Node 100	150	-79.51	--
Pipe 107	151.4	0	-0.0178	Node 100	150	-79.51	Node 101	147	-79.49	0.2104
Pipe 108	31.6	0	0.0000	Node 101	147	-79.49	Node 102	147	-79.49	--
Pipe 109	62.33	0	0.0059	Node 102	147	-79.49	Node 103	148	-79.5	--
Pipe 118	107.1	0	0.2108	Node 87	199.4	-79.03	Node 111	234.9	-79.24	0.854
Pipe 119	65	0	0.1281	Node 111	234.9	-79.24	Node 112	256.5	-79.37	--
Pipe 120	65	0	0.0474	Node 112	256.5	-79.37	Node 113	264.5	-79.42	--
Pipe 121	16.8	0	0.0020	Node 37	280.1	-79.91	Node 114	280.4	-79.92	--
Pipe 122	83.47	0	0.0016	Node 114	280.4	-79.92	Node 115	280.7	-79.92	0.854
Pipe 123	91.29	0	0.0020	Node 115	280.7	-79.92	Node 116	281	-79.92	--
Pipe 124	29.85	0	0.0005	Node 116	281	-79.92	Node 117	281.1	-79.92	--
Pipe 125	36.26	0	0.0000	Node 114	280.4	-79.92	Node 118	280.4	-79.92	0.854
Pipe 126	111.6	0	-0.0006	Node 118	280.4	-79.92	Node 119	280.3	-79.92	--
Pipe 127	248.1	0	0.1515	Input 8	145	-79.2	Node 120	170.5	-79.35	1.788
Pipe 128	162.6	0	-0.0415	Node 121	159	-79.63	Node 122	152	-79.59	2.135

RIVERBEND HEADER MODEL
PIPE AND NODE DIAGRAM - ELEVATIONS



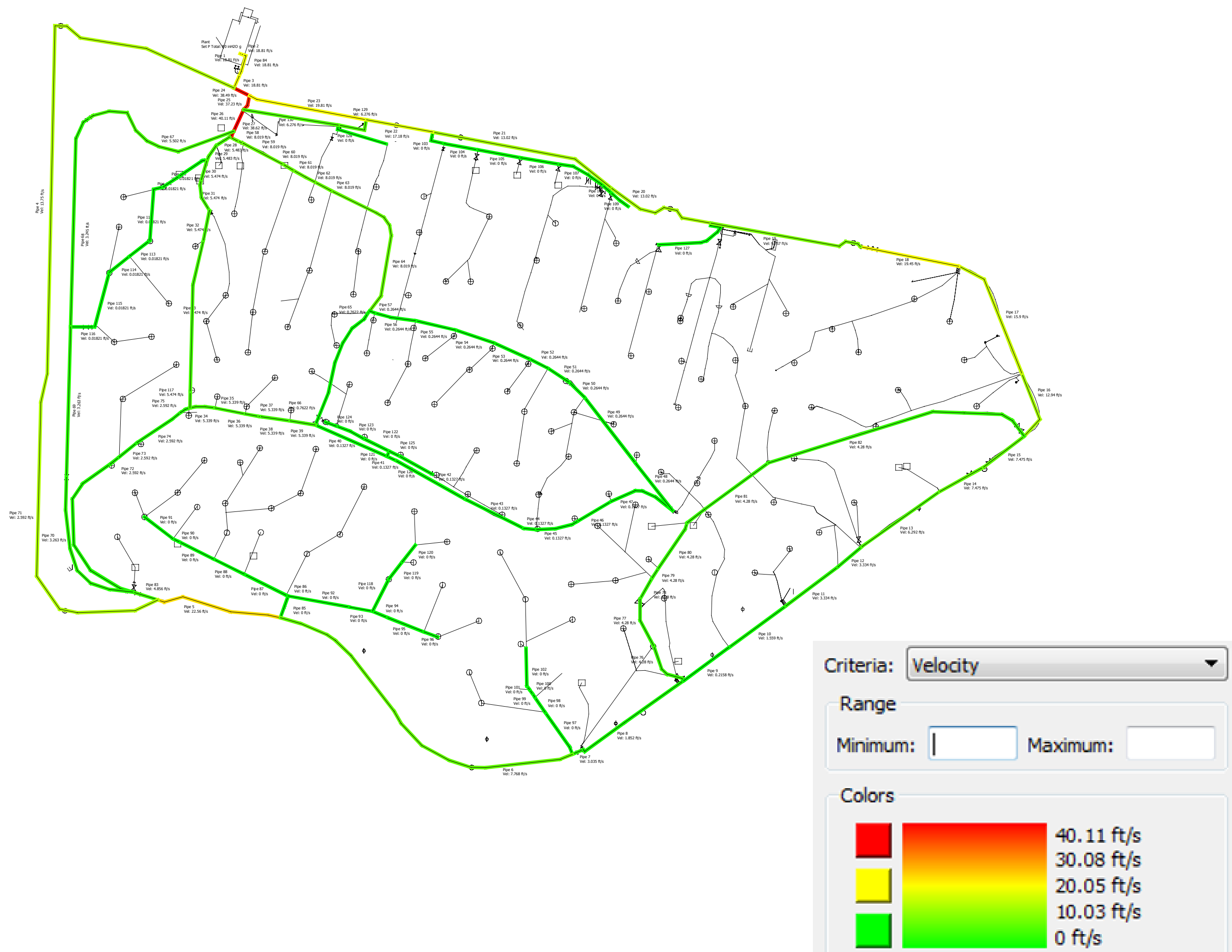
PIPE-FLO Professional		Units						Project Information	
Program Version:	16.1.41643	**Area:**	ft²	**Flow rate:**	scfm	**Heat Transfer Rate:**	BTU/h	**Company:**	
Calculation Method:	Darcy-Weisbach	**Length:**	ft	**Pressure:**	inH2O	**Heat Transfer Coefficient:**	BTU/h*ft²°F	**Project:**	
Maximum Iterations:	100	**Elevation:**	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F	**Drawn by:**	
Percent Tolerance:	0.01 %	**Size:**	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F	**File Name:**	Riverbend Pipe-Flow 2018_scenerio 1.pipe
Laminar Cutoff Re:	2100	**Velocity:**	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU	**Lineup:**	<Design Case>
Allowable Deviation:	1 %			**Viscosity:**	cP	**Atmospheric Pressure:**	405.3 inH2O a	**Print Date:**	Monday, October 01, 2018 02:49 PM

RIVERBEND HEADER MODEL
PIPE DIAGRAM - PRESSURES



PIPE-FLO Professional		Units						Project Information	
Program Version:	16.1.41643	**Area:**	ft²	**Flow rate:**	scfm	**Heat Transfer Rate:**	BTU/h	**Company:**	
Calculation Method:	Darcy-Weisbach	**Length:**	ft	**Pressure:**	inH2O	**Heat Transfer Coefficient:**	BTU/h*ft²°F	**Project:**	
Maximum Iterations:	100	**Elevation:**	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F	**Drawn by:**	
Percent Tolerance:	0.01 %	**Size:**	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F	**File Name:**	Riverbend Pipe-Flow 2018_scenerio 1.pipe
Laminar Cutoff Re:	2100	**Velocity:**	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU	**Lineup:**	<Design Case>
Allowable Deviation:	1 %			**Viscosity:**	cP	**Atmospheric Pressure:**	405.3 inH2O a	**Print Date:**	Monday, October 01, 2018 02:42 PM

RIVERBEND HEADER MODEL
PIPE DIAGRAM - VELOCITIES



PIPE-FLO Professional

Program Version:	16.1.41643
Calculation Method:	Darcy-Weisbach
Maximum Iterations:	100
Percent Tolerance:	0.01 %
Laminar Cutoff Re:	2100
Allowable Deviation:	1 %

Units

Area:	ft²	**Flow rate:**	scfm	**Heat Transfer Rate:**	BTU/h
Length:	ft	**Pressure:**	inH2O	**Heat Transfer Coefficient:**	BTU/h*ft²°F
Elevation:	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F
Size:	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F
Velocity:	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU
		Viscosity:	cP	**Atmospheric Pressure:**	405.3 inH2O a

Project Information

Company:	
Project:	
Drawn by:	
File Name:	Riverbend Pipe-Flow 2018_scenerio 1.pipe
Lineup:	<Design Case>
Print Date:	Monday, October 01, 2018 02:34 PM

APPENDIX A-4:

POSITIVE PRESSURE CALCULATIONS

POSITIVE PRESSURE CALCULATIONS

ASSUMPTIONS

Density of Soil (r_{Soil}) = 110 lbs/ft^3

Final Cover Soil Thickness above HDPE Geomembrane (h) = 2 foot = 24 inches

Proposed positive pressure allowance at an extraction well (P)= 5 inches of water column (inch-wc)

CALCULATION METHODOLOGY

1.) Calculate the amount of downward pressure (T_{Soil}) exerted on the HDPE Geomembrane by the overlying soils.

$$T_{Soil} = (\rho_{Soil})(h) = 220\frac{lb}{ft^2} = 1.5\frac{lb}{in^2} = 42.3 inch - wc$$

2.) Compare the proposed positive (upward) pressure at an extraction well with the downward pressure exerted on the HDPE Geomembrane by the soil. The downward pressure exerted by the soil is approximately 42.3 inch-wc, while the proposed positive (upward) pressure at an extraction well is 5 inch-wc.

RESULTS

Compare the downward pressure to the upward pressure results in a factor of safety of 8.5. Based on the resulting factor of safety (FS), 5 inch-wc of positive pressure at an extraction well is acceptable for the proposed final cover configuration in areas where a HDPE geomembrane or synthetic cover is in place.

APPENDIX B

GCCS DESIGN DRAWINGS

NSPS XXX GAS COLLECTION AND CONTROL DESIGN PLAN
RIVERBEND LANDFILL CO. - McMINNVILLE, OREGON

WASTE MANAGEMENT

OWNER:

RIVERBEND LANDFILL CO.
13469 SW HIGHWAY 18
McMINNVILLE, OREGON 97128

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	FINAL BUILDOUT GCCS PLAN
3	TYPICAL LFG DETAILS - 1
4	TYPICAL LFG DETAILS - 2

ENGINEER:

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W, SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765

CEC JOB NO. 101.78.07

OCTOBER 2018

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REV	MM/DD/YR	DESCRIPTION	DWN BY	APP BY

TITLE: TITLE SHEET

PROJECT: NSPS XXX GCCS DESIGN PLAN
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

CLIENT: RIVERBEND LANDFILL CO.
RIVERBEND LANDFILL - McMINNVILLE, OREGON

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765
FAX (704) 283-9755

REGISTERED PROFESSIONAL ENGINEER
91189PE
OREGON
MAY 10, 2016
SETH A. NUNES
10-1-18
RENEWAL DATE: 12-31-2018

CEC COA#: 1192731-91
SCALE: NTS

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PROJECT NO.: 101.78.07
DWG: 2018 XXX GCCS PLAN
DATE: OCTOBER 2018
SHEET NO.: 1 OF 4

LEGEND

- HEADER/LATERAL
- EXTRACTION WELL
- HORIZONTAL COLLECTOR WELLHEAD
- C001 REMOTE WELLHEAD
- LCO-1 CS-4 CONDENSATE SUMP
- ISOLATION VALVE
- FLANGE
- REDUCER

NOTES:

1. TOPOGRAPHIC CONTOURS OBTAINED FROM GEOSPACIAL SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS OBTAINED ON MARCH 6, 2018. VERTICAL DATUM IS BASED ON NAVD88.
2. FINAL BUILDOUT BASED ON THE OCTOBER 2017 PLANS PROVIDED BY BULLSEYE DESIGN SERVICES, INC. (281-516-1794).
3. AS-BUILT LFG SYSTEM INFORMATION PROVIDED BY RIVERBEND AND LELAND MACDONALD & ASSOCIATES, LLC.

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REV	MM/DD/YR	DESCRIPTION	DWN BY	APP BY

TITLE: **FINAL BUILDOUT GCCS PLAN**

PROJECT: **NSPS XXX GCCS DESIGN PLAN**
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

CLIENT: **RIVERBEND LANDFILL CO.**
RIVERBEND LANDFILL - McMINNVILLE, OREGON

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765
FAX (704) 283-9755

REGISTERED PROFESSIONAL ENGINEER 91189PE OREGON MAY 10, 2018 SETH A. NUNES
10-1-18
RENEWAL DATE: 12-31-2018

CEC COA#: 1192731-91 | SCALE: 1" = 120' | PROJECT NO.: 101.78.07

DWG: 2018 XXX GCCS PLAN

DATE: OCTOBER 2018

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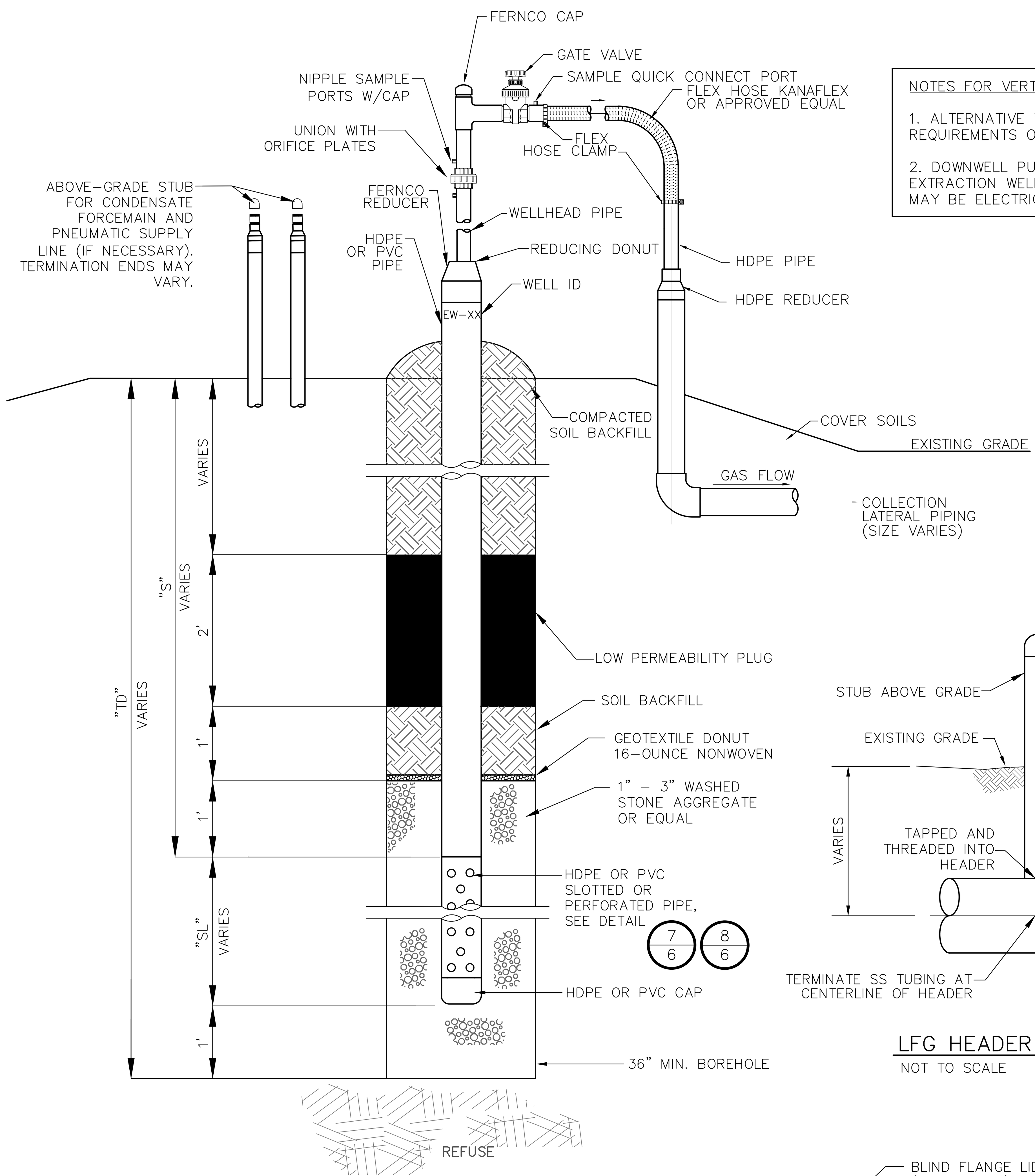
SHEET NO.: 2 OF 4

	1	2	3	4	5	6	7	8

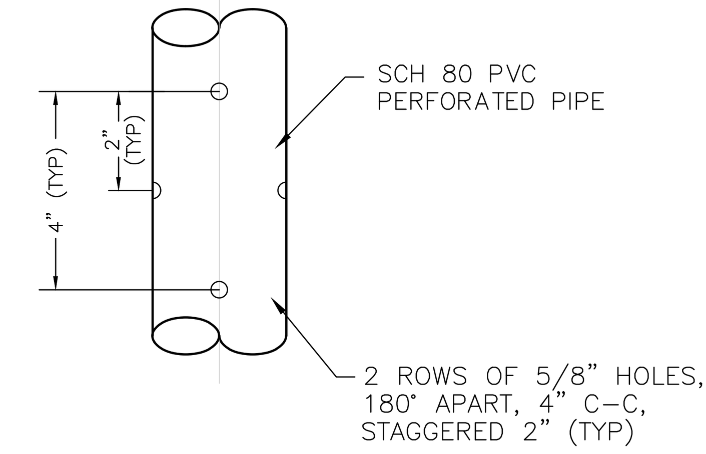


VERTICAL EXTRACTION WELL DETAIL 1/6
NOT TO SCALE

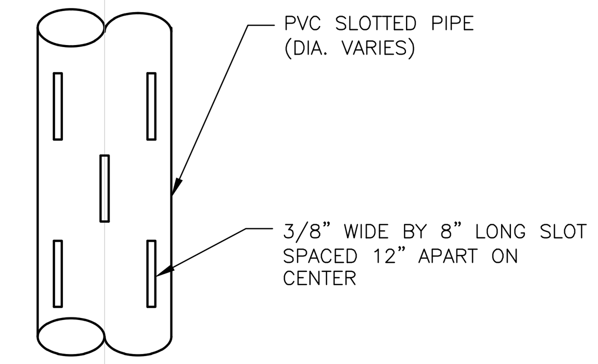
NOTES FOR VERTICAL EXTRACTION WELLS:

1. ALTERNATIVE WELLHEADS THAT MEET THE REQUIREMENTS OF NSPS ARE ACCEPTABLE.

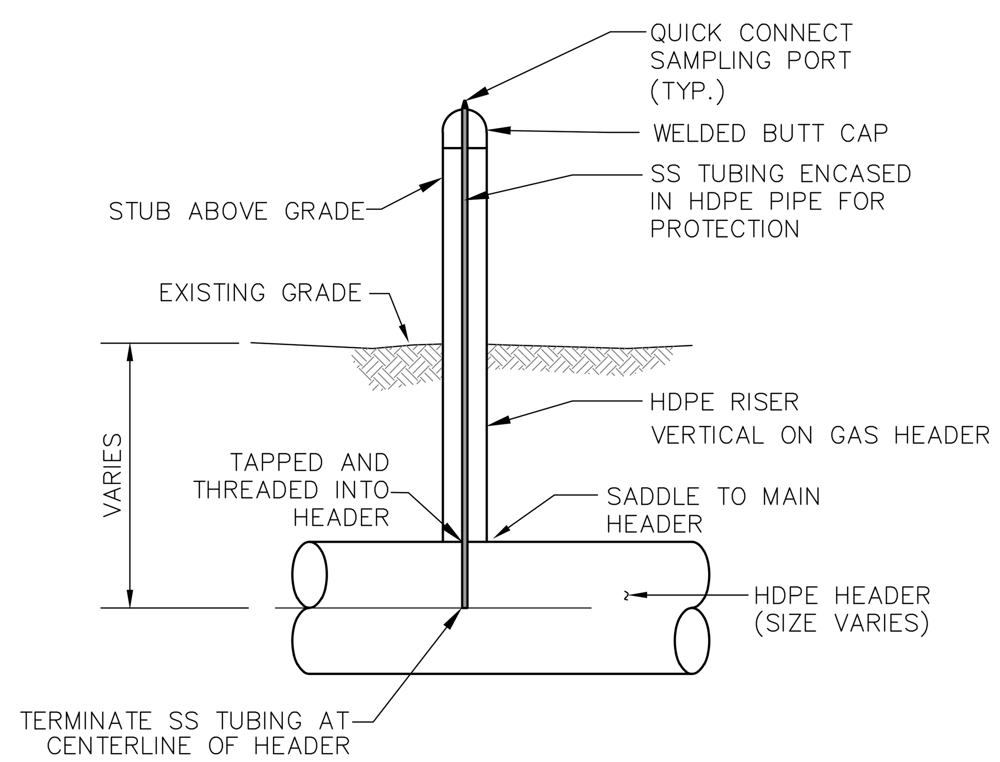
2. DOWNWELL PUMPS MAY BE USED IN VERTICAL EXTRACTION WELLS AS NEEDED. DOWNWELL PUMPS MAY BE ELECTRIC OR PNEUMATICALLY OPERATED.



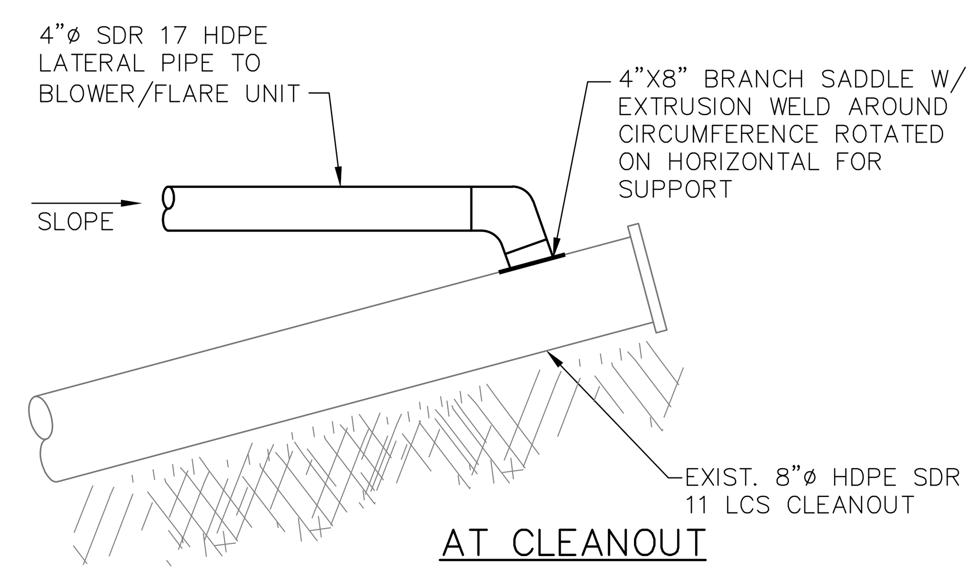
PERFORATED PIPE 7/6
NOT TO SCALE



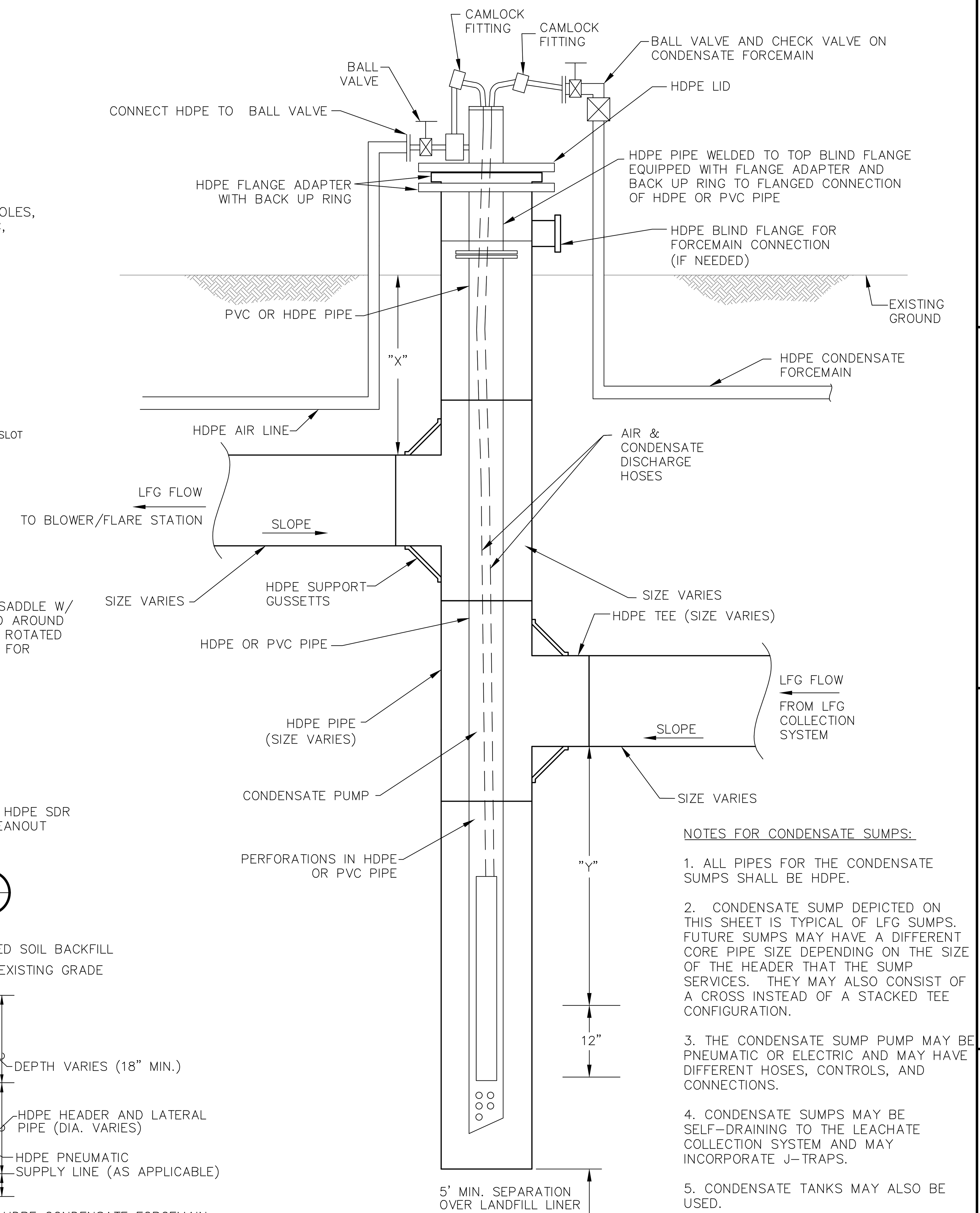
SLOTTED PIPE 8/6
NO SCALE



LFG HEADER SAMPLE PORTS 4/6
NOT TO SCALE



LCS CLEANOUT TIE-IN 9/6
NOT TO SCALE



CONDENSATE SUMP DETAIL 11/6
NO SCALE

NOTES FOR CONDENSATE SUMPS:

1. ALL PIPES FOR THE CONDENSATE SUMPS SHALL BE HDPE.

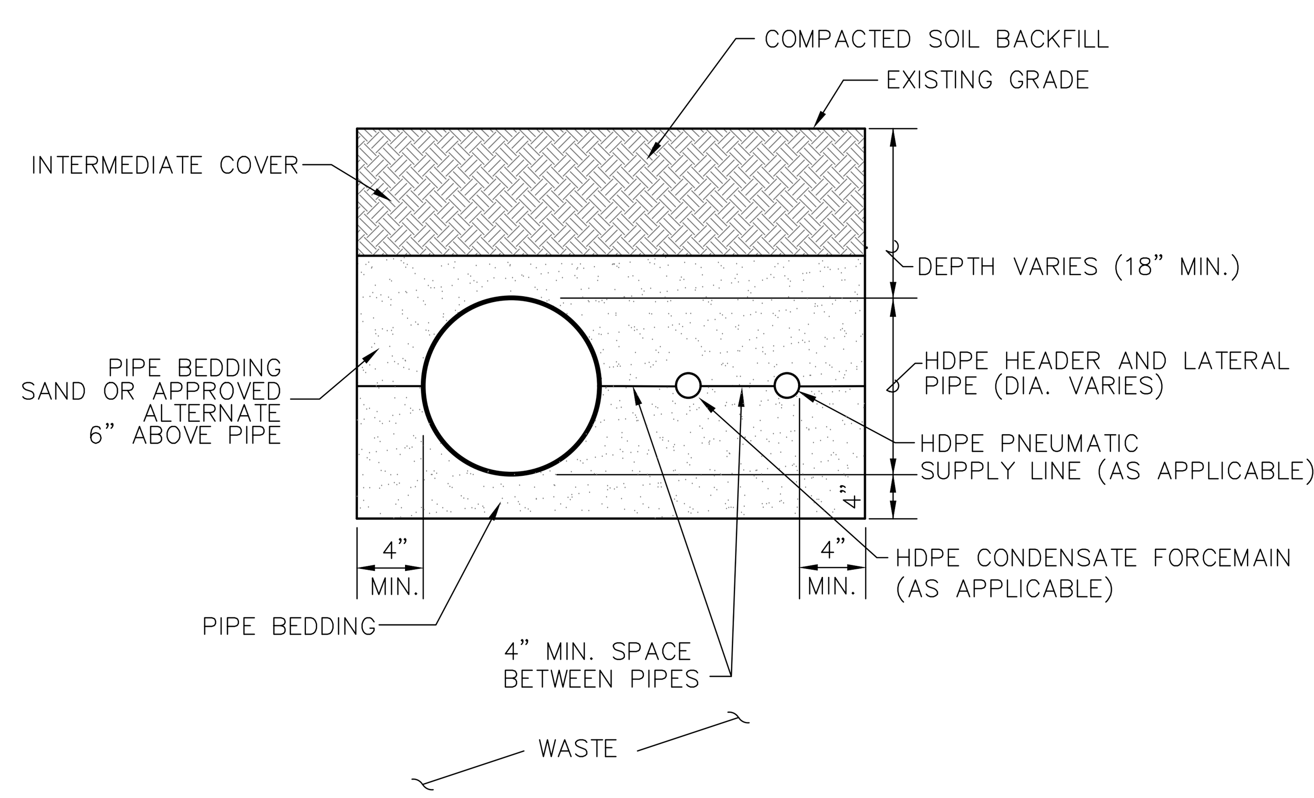
2. CONDENSATE SUMP DEPICTED ON THIS SHEET IS TYPICAL OF LFG SUMPS. FUTURE SUMPS MAY HAVE A DIFFERENT CORE PIPE SIZE DEPENDING ON THE SIZE OF THE HEADER THAT THE SUMP SERVICES. THEY MAY ALSO CONSIST OF A CROSS INSTEAD OF A STACKED TEE CONFIGURATION.

3. THE CONDENSATE SUMP PUMP MAY BE PNEUMATIC OR ELECTRIC AND MAY HAVE DIFFERENT HOSES, CONTROLS, AND CONNECTIONS.

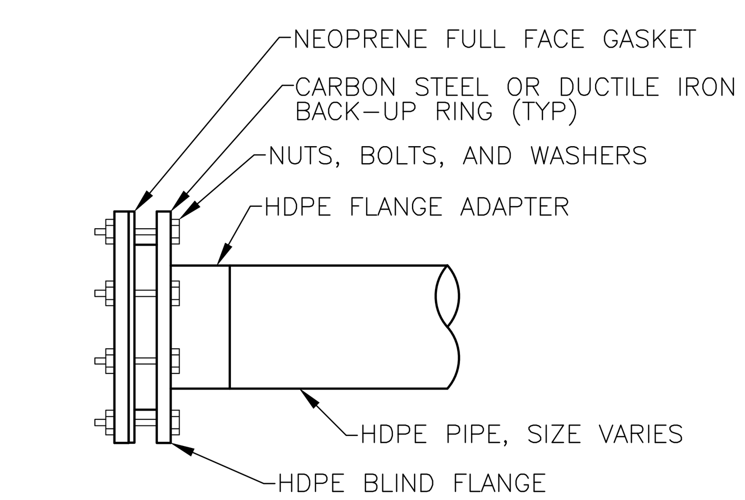
4. CONDENSATE SUMPS MAY BE SELF-DRAINING TO THE LEACHATE COLLECTION SYSTEM AND MAY INCORPORATE J-TRAPS.

5. CONDENSATE TANKS MAY ALSO BE USED.

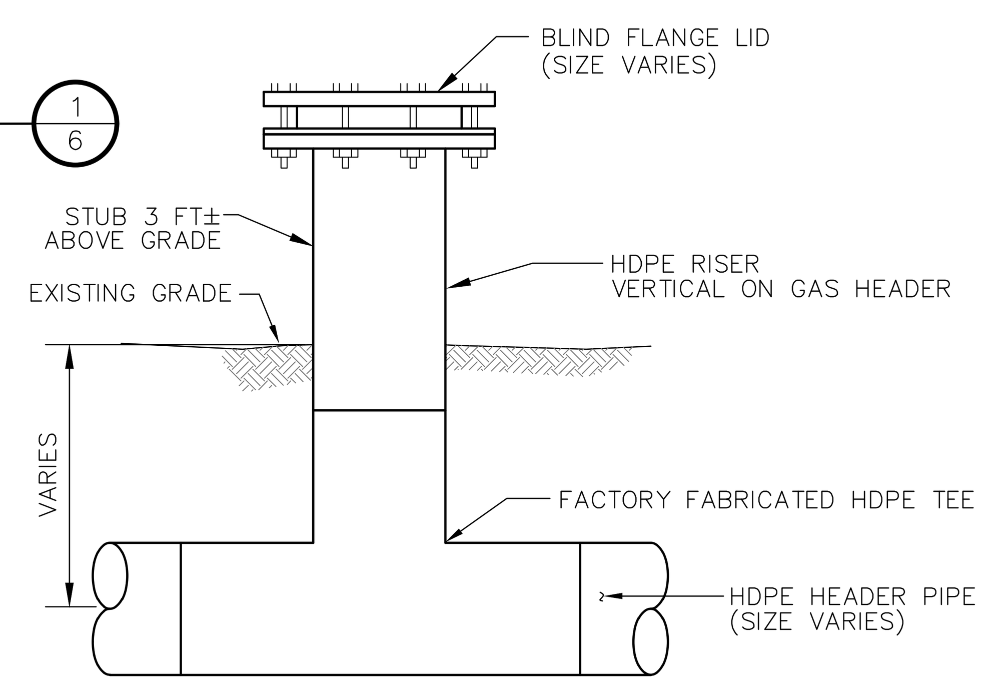
6. LENGTH AND DEPTH OF THE CONDENSATE SUMP WILL BE DETERMINED BASED ON THE DESIRED VACUUM AND AVAILABLE REFUSE DEPTH.



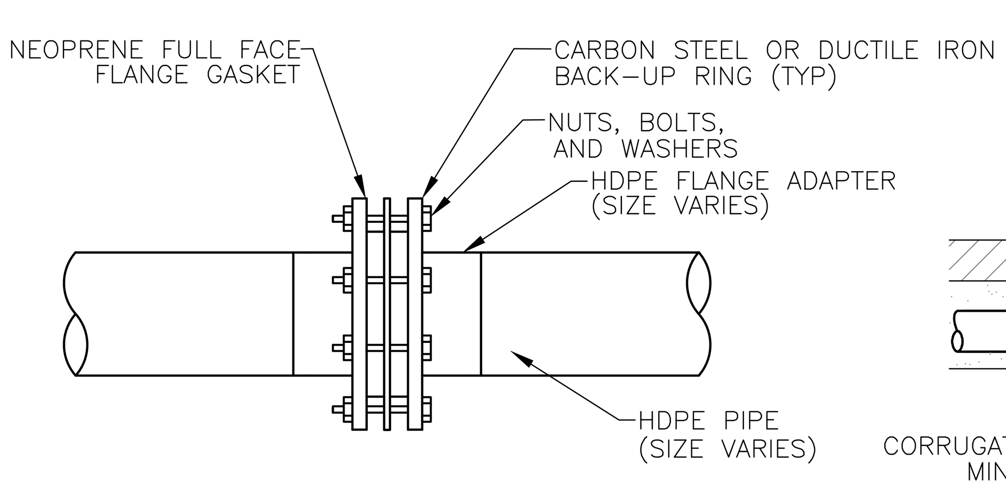
LFG HEADER/LATERAL TRENCH DETAIL 10/6
NO SCALE



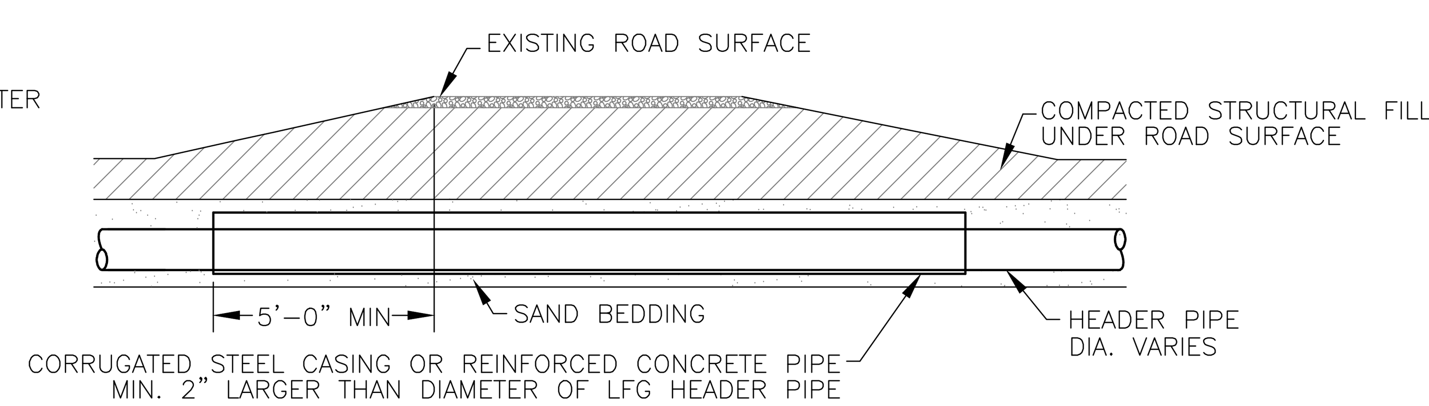
HEADER PIPE BLIND FLANGE 2/6
NOT TO SCALE



LFG HEADER DAYLIGHT 5/6
NOT TO SCALE



FLANGE CONNECTION 3/6
NOT TO SCALE



ROAD CROSSING DETAIL 6/6
NOT TO SCALE

NOTES:

THE DETAILS SHOWN ON THIS SHEET ARE TYPICAL LANDFILL GAS COMPONENTS THAT MAY BE USED IN THE ACTUAL LFG COLLECTION SYSTEM AT THE TRAIL RIDGE LANDFILL. THE OWNER MAY ALTER THE DETAILS SHOWN HERE AS NEEDED TO COMPLY WITH THE NSPS AND TO SUIT ACTUAL FIELD CONDITIONS.

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REV	MM/DD/YR	DESCRIPTION	DWN BY	APP BY

TITLE: **TYPICAL LFG DETAILS - 1**

PROJECT: **NSPS XXX GCCS DESIGN PLAN**
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

CLIENT: **RIVERBEND LANDFILL CO.**
RIVERBEND LANDFILL - McMINNVILLE, OREGON

CARLSON ENVIRONMENTAL CONSULTANTS, PC

1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765
FAX (704) 283-9755

REGISTERED PROFESSIONAL ENGINEER 91189PE OREGON MAY 10, 2016 SETH A. NUNES 10-1-18
RENEWAL DATE: 12-31-2018

CEC COA#: 1192731-91 | SCALE: NTS

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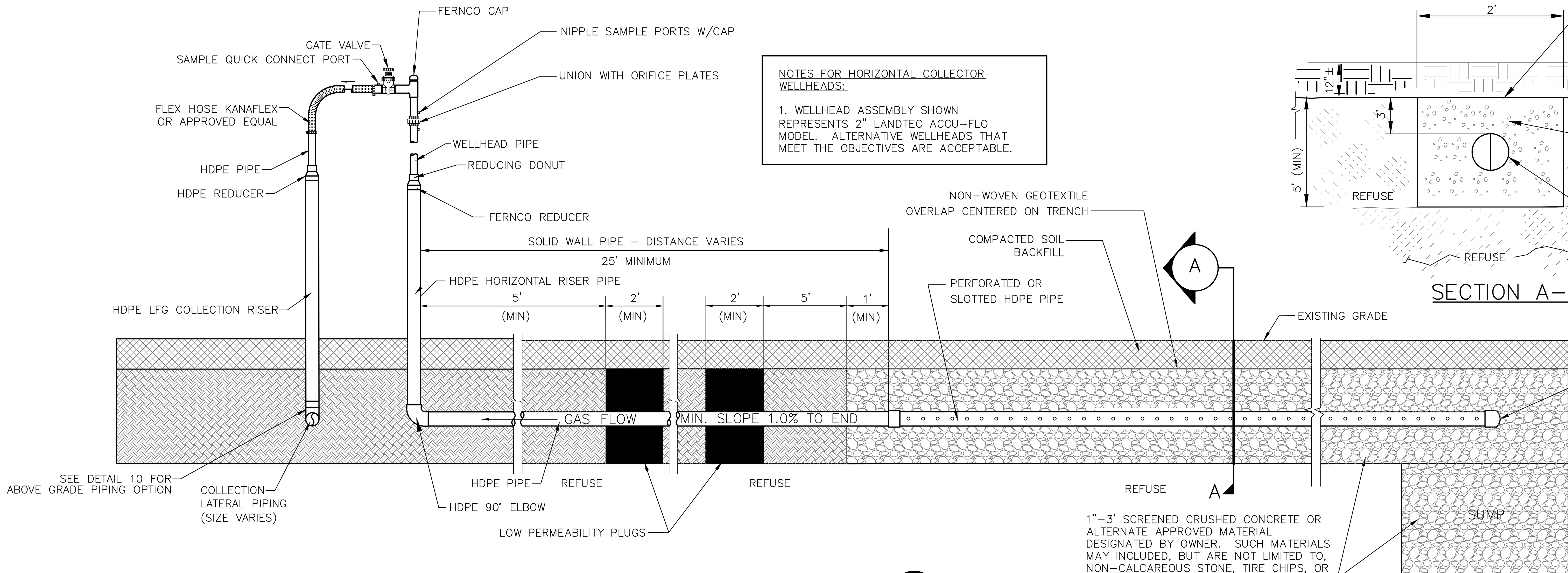
PROJECT NO.: 101.78.07
DWG: 2018 XXX GCCS PLAN
DATE: OCTOBER 2018
SHEET NO.: 3 OF 4

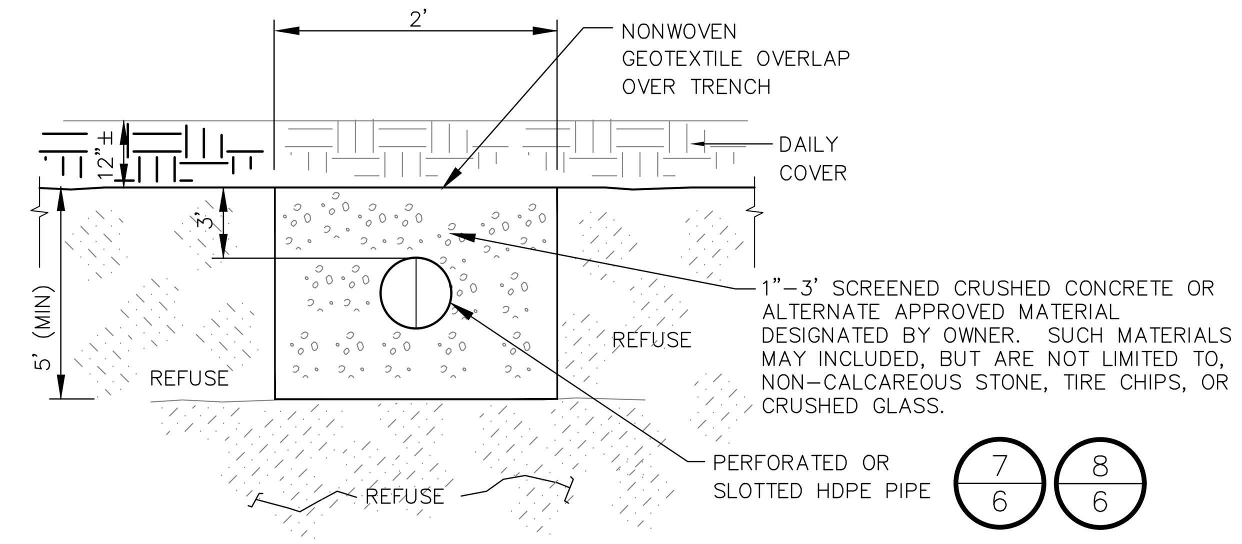
A	B	C	D	E



NOTES FOR HORIZONTAL COLLECTOR WELLHEADS:

1. WELLHEAD ASSEMBLY SHOWN REPRESENTS 2" LANDTEC ACCU-FLO MODEL. ALTERNATIVE WELLHEADS THAT MEET THE OBJECTIVES ARE ACCEPTABLE.

HORIZONTAL COLLECTOR 12/7
NOT TO SCALE



SECTION A–A

NOTES FOR HORIZONTAL COLLECTORS:

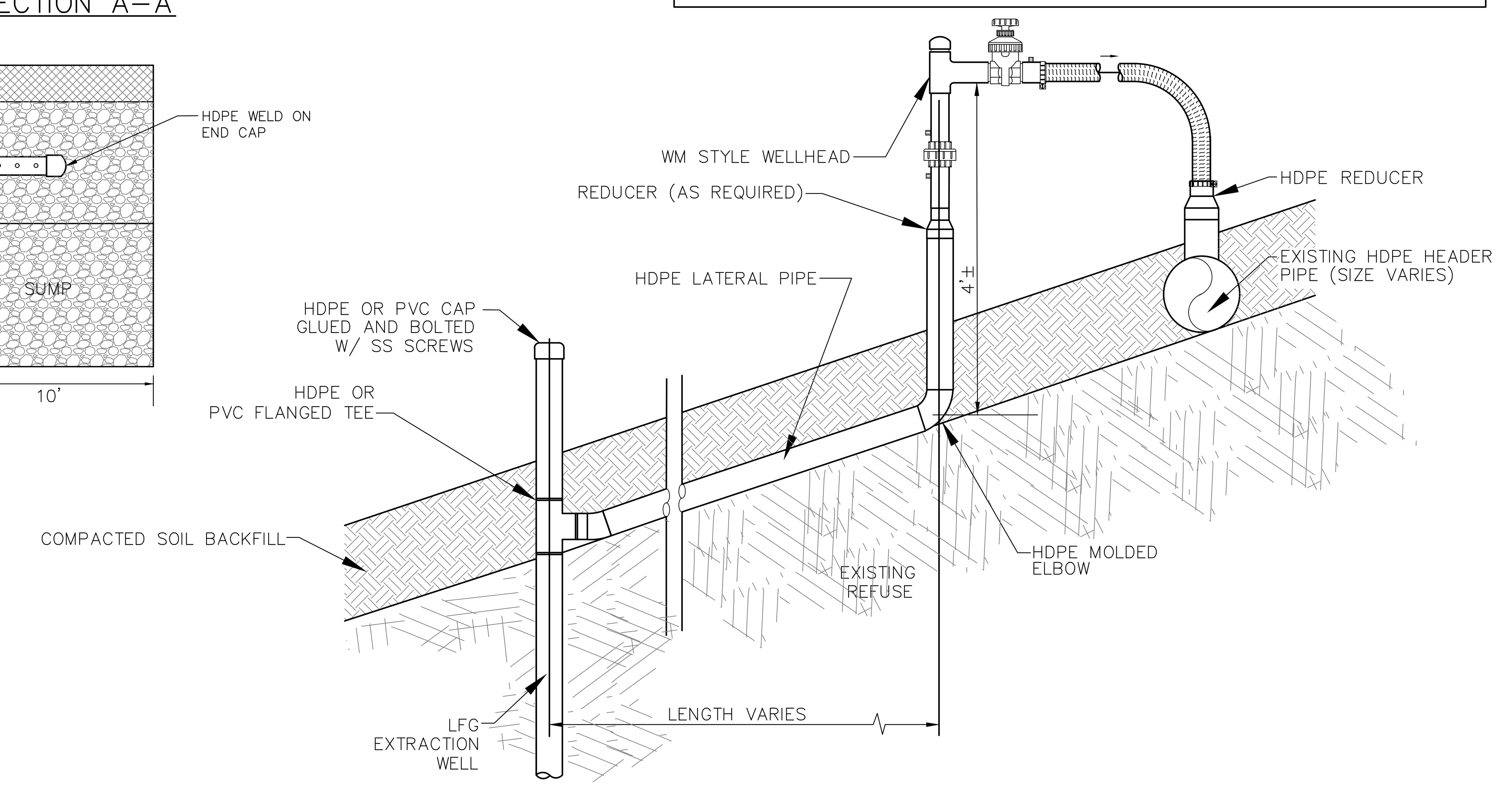
1. HORIZONTAL COLLECTORS TO BE INSTALLED AT A 1.0% SLOPE (MINIMUM).

2. AT LOW POINT DRAINAGE SUMP TO BE INSTALLED. DRAINAGE SUMP CONSISTS OF AN OVEREXCAVATION OF APPROXIMATELY 5' BY 10' SQUARE (ALONG THE TRENCH BOTTOM) BACKFILLED WITH AGGREGATE FOR CONDENSATE DRAINAGE.

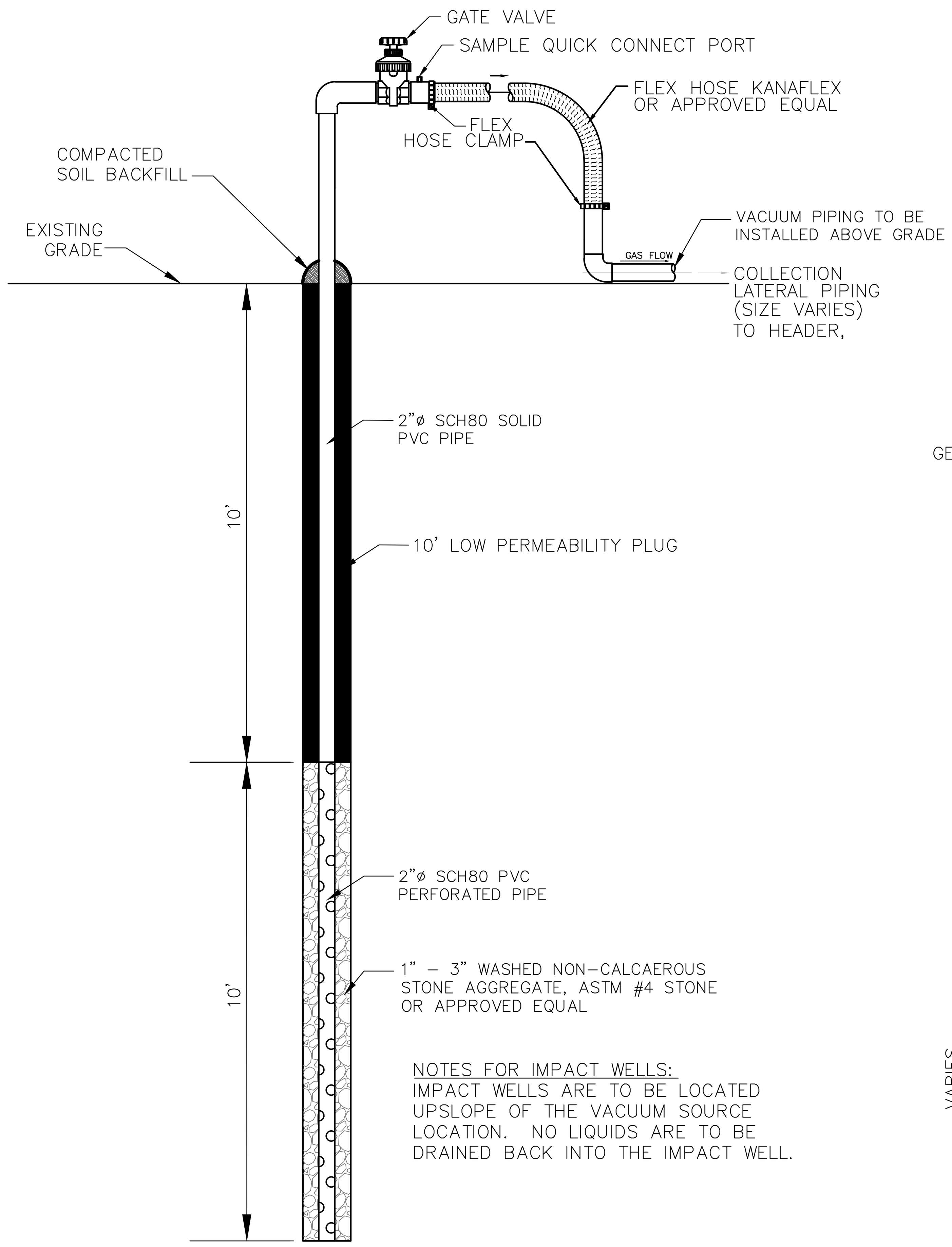
3. WELLHEADS WILL BE PLACED AT THE ENDS OF THE HORIZONTAL COLLECTORS. HORIZONTAL COLLECTORS MAY BE EXTENDED BEYOND LOW POINT SO A HIGH POINT IS LOCATED ON BOTH ENDS. IN THAT CASE, WELLHEADS MAY BE INSTALLED ON BOTH ENDS OF THE HORIZONTAL COLLECTOR. THE HORIZONTALS ARE TO BE DAYLIGHTED USING A 90° HDPE ELBOW AND AN HDPE RISER EXTENDING ABOVE GRADE FOR CONNECTION OF WELLHEAD.

4. EXCAVATED WASTE MAY BE USED TO BACKFILL THE TRENCHES ONCE THE REQUIRED DEPTH OF CRUSHED CONCRETE AND GEOTEXTILE HAS BEEN INSTALLED OVER THE HORIZONTAL PIPE. ANY EXCAVATED WASTE THAT CANNOT BE BACKFILLED IN THE HORIZONTAL TRENCH WILL BE TAKEN TO THE ACTIVE FACE.

5. MINIMAL VACUUM SHALL BE APPLIED TO THE HORIZONTAL COLLECTOR UNTIL AT LEAST 10 FEET OF WASTE IS PLACED ABOVE THE HORIZONTAL COLLECTOR.

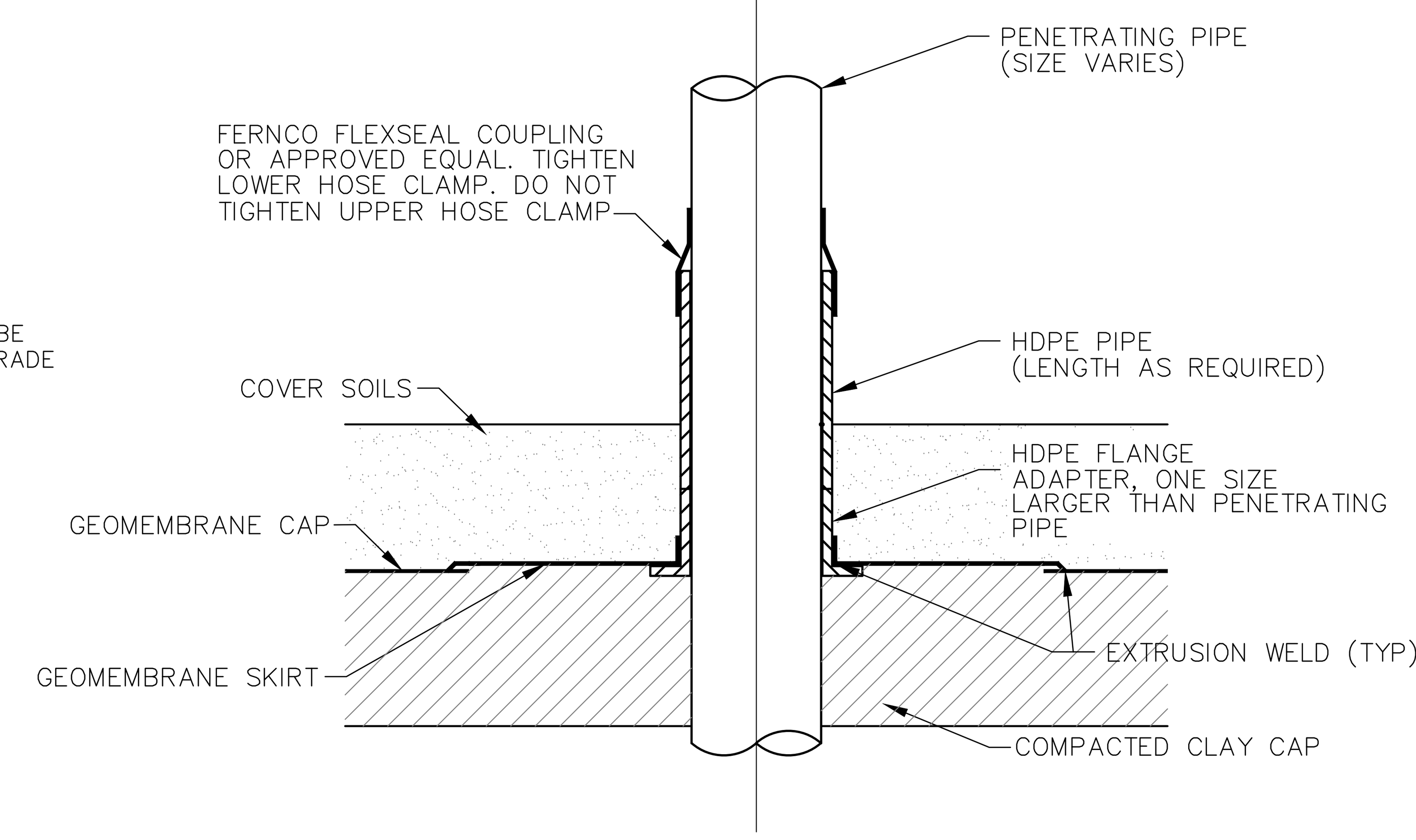


DOWNSLOPE EXTRACTION WELL DETAIL 16/7
NOT TO SCALE

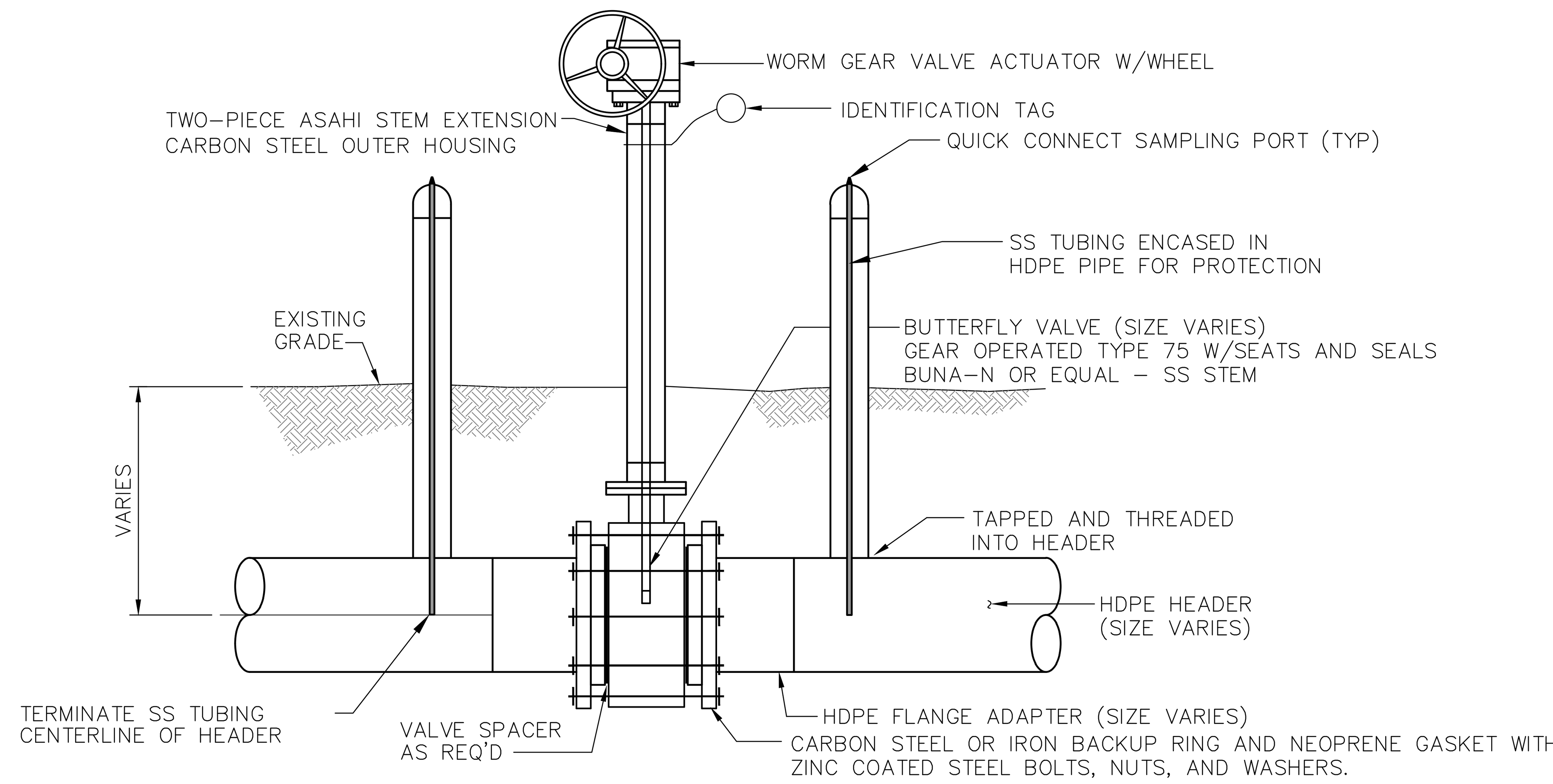


NOTES FOR IMPACT WELLS:
IMPACT WELLS ARE TO BE LOCATED UPSLOPE OF THE VACUUM SOURCE LOCATION. NO LIQUIDS ARE TO BE DRAINED BACK INTO THE IMPACT WELL.

IMPACT WELL 13/7
NO SCALE



PIPE PENETRATION BOOT 14/7
NO SCALE



LFG COLLECTION SYSTEM BUTTERFLY VALVE DETAIL 15/7
NOT TO SCALE

NOTES:

1. THE DETAILS SHOWN ON THIS SHEET ARE TYPICAL LANDFILL GAS COMPONENTS THAT MAY BE USED IN THE ACTUAL LFG COLLECTION SYSTEM AT THE TRAIL RIDGE LANDFILL. THE OWNER MAY ALTER THE DETAILS SHOWN HERE AS NEEDED TO COMPLY WITH THE NSPS AND TO SUIT ACTUAL FIELD CONDITIONS.

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NOT FOR CONSTRUCTION

TITLE: **TYPICAL LFG DETAILS - 2**

PROJECT: **NSPS XXX GCCS DESIGN PLAN**
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

CLIENT: **RIVERBEND LANDFILL CO.**
RIVERBEND LANDFILL - McMINNVILLE, OREGON

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
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REGISTERED PROFESSIONAL ENGINEER 91189PE OREGON MAY 10, 2016 SETH A. NUNES 10-1-18
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CEC COA#: 1192731-91 | SCALE: NTS

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PROJECT NO.: 101.78.07
DWG: 2018 XXX GCCS PLAN
DATE: OCTOBER 2018
SHEET NO.: 4 OF 4

REV	MM/DD/YR	DESCRIPTION	DWN BY	APP BY

APPENDIX C

SURFACE EMISSIONS MONITORING PLAN

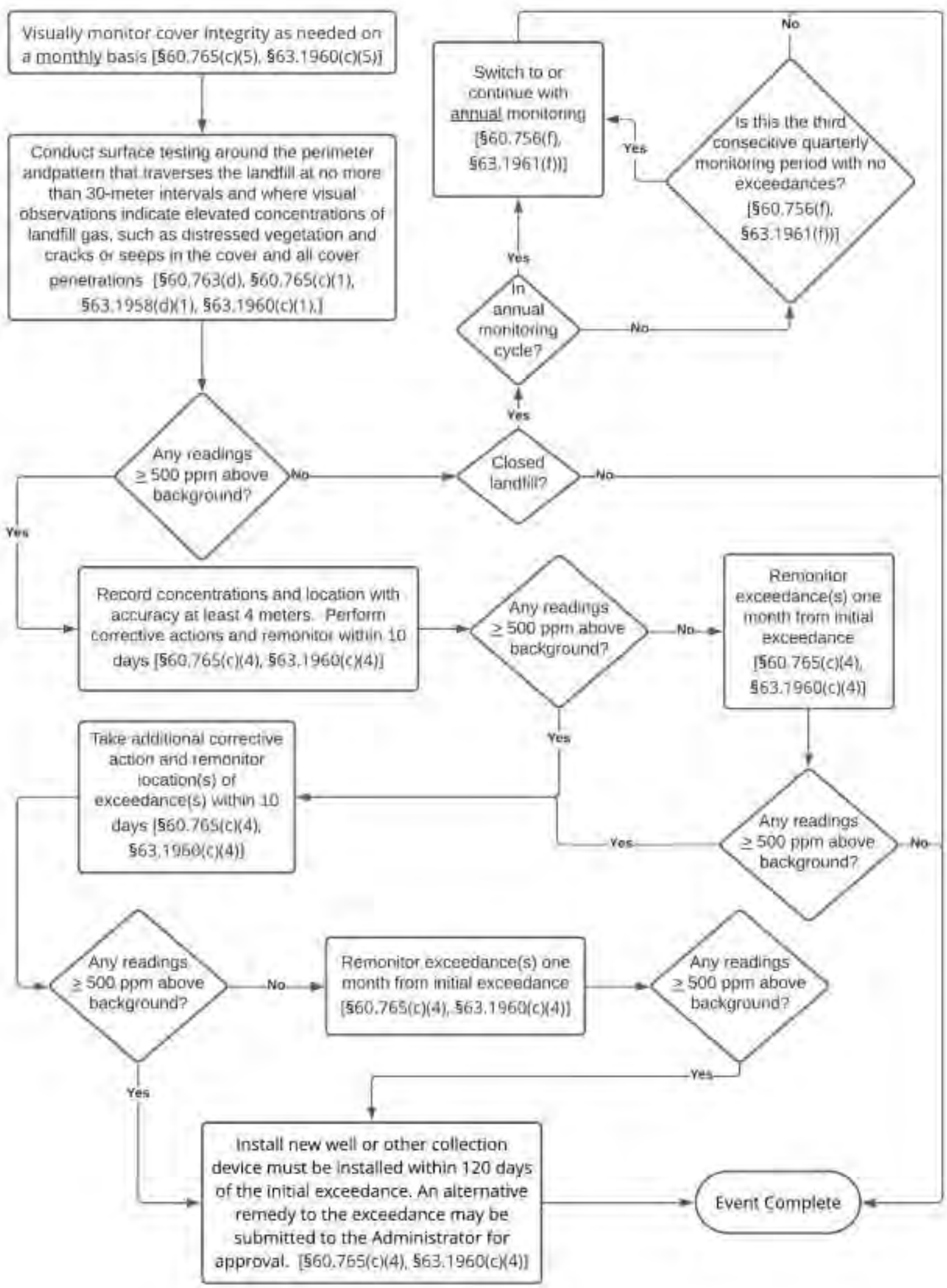
RIVERBEND LANDFILL
CO. McMinnville OR.

SURFACE EMISSIONS MONITORING PROTOCOL

CONTENTS

USEPA SURFACE EMISSIONS MONITORING FLOW CHART 3
INTRODUCTION 4
MONITORING ROUTE MEASUREMENTS 4
SURFACE EMISSIONS ROUTE MAP 5
DANGEROUS AREAS 6
MONITORING FREQUENCY 6
APPROVED EQUIPMENT 7
CALIBRATION GASES 7
CALIBRATION AND BACKGROUND READINGS 7
STANDARD CALIBRATION PROCEDURES 8
STEP 1: ASSEMBLE INSTRUMENT, POWER ON AND WARM UP 8
STEP 2: RESPONSE FACTOR 8
STEP 3: CALIBRATION OF INSTRUMENT (each time Before USe) 8
STEP 4: CALIBRATION PRECISION (every 3 months) 8
STEP 5: RESPONSE TIME (once before new commissioning) 9
STEP 6: UPWIND/DOWNWIND READINGS (before each use) 9
SCHEDULING OF MONITORING EVENT 11
MONITORING PROCEDURES 11
SURFACE EMISSIONS MONITORING 11
PENETRATION MONITORING 12
MONITORED EXCEEDANCE LOCATIONS 13
EXCEEDANCE REPAIR PROCEDURES 13
MONITORED EXCEEDANCE RECHECKS 14
1-MONTH RE-MONITORING 15
REPORT PREPARATION 16
COVER LETTER 16
FIGURE 1 SITE PLAN 16
TABLE 1 – SURFACE/Penetration/ MONITORING EXCEEDANCES AND CORRECTIVE ACTIONS 16
ATTACHMENT 1 – CALIBRATION RECORDS 16
ATTACHMENT 2 – CALIBRATION GASES CERTIFICATES OF ANALYSIS 16

ATTACHMENT A - SURFACE EMISSIONS MONITORING REFERENCE STANDARDS
ATTACHMENT B - SAMPLE CALIBRATION FORMS
ATTACHMENT C – SAMPLE EXCEEDANCE LOG


Visually monitor cover integrity as needed on a monthly basis [§60.765(c)(5), §63.1960(c)(5)]
Conduct surface testing around the perimeter andpattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover and all cover penetrations [§60.763(d), §60.765(c)(1), §63.1958(d)(1), §63.1960(c)(1).]
Any readings ≥ 500 ppm above background?
No
Yes
Closed landfill?
In annual monitoring cycle?
Switch to or continue with annual monitoring [§60.756(f), §63.1961(f))]
Is this the third consecutive quarterly monitoring period with no exceedances? [§60.756(f), §63.1961(f))]
Record concentrations and location with accuracy at least 4 meters. Perform corrective actions and remonitor within 10 days [§60.765(c)(4), §63.1960(c)(4)]
Remonitor exceedance(s) one month from initial exceedance [§60.765(c)(4), §63.1960(c)(4)]
Take additional corrective action and remonitor location(s) of exceedance(s) within 10 days [§60.765(c)(4), §63.1960(c)(4)]
Remonitor exceedance(s) one month from initial exceedance [§60.765(c)(4), §63.1960(c)(4)]
Install new well or other collection device must be installed within 120 days of the initial exceedance. An alternative remedy to the exceedance may be submitted to the Administrator for approval. [§60.765(c)(4), §63.1960(c)(4)]
Event Complete

INTRODUCTION

Monitoring procedures have been developed bythe United States Environmental Protection Agency (EPA) to help determine the effectiveness of active landfill gas (LFG) collection systems in reducing fugitive emissions from landfills.

Riverbend Landfill is required to perform Surface Emissions Monitoring (SEM) by New Source Performance Standards (NSPS) and National Emission Standards for HazardousAir Pollutants (NESHAP) regulations. Surface Emissions Monitoring is required for all landfill areas/locations that contain a LFG collection and control system subject to NSPS and NESHAP. Riverbend Landfill is subject to 40 CFR 60, Subpart XXX. Surface Emissions Monitoring is to be performed as specified in 40 CFR §60.765 (c) and (d), and 40 CFR 60, Appendix A, Method 21 (see Attachment A for rule language and Method 21). Riverbend Landfill is *also* subject to 40 CFR 63, Subpart AAAA (NMOC emission rate equal to or greater than 50 Mg/yr), Surface Emissions Monitoring is to be performed as specified in 40 CFR §63.1958(d), §63.1960 (c) and (d) and §63.1961(f).

These regulations require surface monitoring around the perimeter and within the active LFG collection area where waste exceeds two years in age at final grade or five years in age at interim grades.

This plan does not address changes to Surface Emissions Monitoring that will be required under the newly adopted Landfill Methane Rule, OAR Chapter 340, Division 239. The monitoring requirements do not go into effect until August 1, 2022. This plan will be updated prior to implementing these requirements.

MONITORING ROUTE MEASUREMENTS

The following landfill areas are monitored during each SEM and penetration monitoring event at Riverbend Landfill:

- The entire perimeter of the landfill collection area.
- All areas of waste placement that exceed two years in age or are at final grade or are five years in age at interim grades.
- Measurements are taken along a 30-meter serpentine path.
- Measurements are taken in areas where visual observations indicate elevated concentrations of LFG (such as distressed vegetation and cracks or seeps in the cover). See Monitoring Procedures section.

As Riverbend Landfill is subject to 40 CFR 60, Subpart XXX and 40 CFR 63, Subpart AAAA, see Monitoring Procedures section. The following general requirements also apply:

- If a monitoring exceedance is observed (>500 ppmv), the technician will follow the procedures in the Monitored Exceedance Location section.

- All "penetrations" on the landfill in the LFG collection area must be included in the monitoring.

SURFACE EMISSIONS ROUTE MAP

A surface emissions monitoring plan is required as part of the site's NSPS GCCS Design Plan. The surface emissions monitoring plan provided in the NSPS GCCS Design Plan is developed based on the proposed final waste grades. Prior to the landfill reaching final grades, interim surface emissions routes are used to cover the current fill areas of the landfill.

An interim surface monitoring route map has been developed for Riverbend Landfill. The route map includes a topographical map with the monitoring route applied to the surface. The interim route map identifies any areas of the landfill where deviations from the 30-meter intervals (i.e., exempted areas, etc.) occurred. The monitoring route has been developed for all areas within the active LFG collection area where waste exceeds two years in age at final grade or five years in age at interim grades and around the perimeter. Riverbend Landfill has no areas that are excluded from monitoring except for dangerous areas.

On April 6, 2020, Riverbend Landfill became subject to NSPS XXX and NESHAP AAAA including cover penetration monitoring. Riverbend Landfill has prepared a surface penetration drawing that identifies all cover penetrations required to be monitored. This drawing is used to locate penetrations, confirm quarterly penetration monitoring, and identify which penetrations were excluded from monitoring due to dangerous areas. The drawing is reviewed and updated each quarter and records will be maintained with the surface monitoring route map.

The surface emissions route map, penetration, drawing will be provided to the contractor for review prior to monitoring at the site.

Since surface emissions monitoring is performed by a field technician on foot, the following should be considered when conducting the monitoring:

- Prepare the route in a downhill fashion
- Riverbend is large, monitoring routes are broken into several smaller routes
- Avoid any uphill climbs when possible
- Provide landmarks on the route map to guide technician along the route (e.g., LFG extraction wells)
- If the site is being actively filled, use recent topographic information to identify the location of active areas, roads, stormwater features, berms, etc.
- Perimeter of the landfill area is also required to be monitored.

DANGEROUS AREAS

Surface emissions monitoring may involve exposure to hazardous walking and working surfaces, hazardous materials, active landfilling operations, traffic and operating heavy equipment. Landfills can present certain physical hazards; therefore, there are areas that the technician should not monitor for their safety. Though these areas may be subject to NSPS/NESHAP and require monitoring the risks of monitoring these areas are too high. The regulations allow for the exclusion of these dangerous areas for the safety of the technician. It is the responsibility of the technician to establish appropriate safety and health practices and determine the applicability of regulatory limitations. These dangerous areas are discussed in detail below.

Riverbend Landfill defines the areas that would qualify as "Dangerous Areas" in compliance with 40 CFR §763(d). Areas that qualify as dangerous areas include but are not limited to: construction trenches or, snow or ice-covered slopes, exposed temporary cover tarps, roads, the working face, construction areas, and stockpiles (soil, rock, materials, etc.). If an area qualifies as dangerous, the technician will delineate on the route map the location of the dangerous area, and the reason it qualifies as dangerous.

Excluding NSPS/NESHAP areas from a surface scan should be limited; WM Area air program specialist, landfill operations personnel, and the surface scan technician should work together to monitor as much of the applicable NSPS areas as possible.

A minimum 150-foot buffer from active construction and filling areas must be maintained during the surface scan even though these areas may be subject to NSPS/NESHAP monitoring requirements. The landfill working face is considered a dangerous area, the landfill working face contains heavy traffic as well as uncompacted and uncovered waste all of which lead to dangerous conditions for the technician on foot. The technician will need to note the location of the active area(s)on the route map, and that the area(s) was/were not monitored.

MONITORING FREQUENCY

40 CFR §60.765(c)(1) and 40 CFR §63.1960(c)(1) require that surface emissions monitoring be conducted on the areas of the landfill subject to NSPS and NESHAPs regulations on a quarterly basis. Penetration monitoring will be conducted on the areas of the landfill subject to NSPS and NESHAPs regulations on a quarterly basis. However, as discussed in 40 CFR §60.766(f) and 40 CFR §63.1961(f), any closed landfill area that has no monitored exceedances in three (3) consecutive quarterly monitoring periods may convert to annual monitoring. Any methane reading of 500 ppmv or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

Riverbend Landfill has currently not identified any closed areas that are excluded from SEM. Riverbend Landfill defines a closed landfill area as any one of the following:

- Closed facility: a landfill in which solid waste is no longer being placed, and in which no additional solid wastes will be placed without first filing a notification of modification as prescribed under 40 CFR §60.761

- Closed Landfill located next to an active landfill.

- Closed Area of Landfill: an Agency-approved variance request is required to exclude closed areas at an active landfill from surface emission monitoring, unless the Landfill is a Closed Site.

The final report that is submitted for each surface monitoring event will clearly delineate the monitoring frequency of landfill areas at the Site if there are any on an annual monitoring schedule.

APPROVED EQUIPMENT

METHANE DETECTOR

Some examples of devices used for surface emissions monitoring include, but are limited to:

- Landtec QED SEM 5000: https://www.landtecna.com/product/sem5000-portable-methane-detector/

- Elkins Earthworks, LLC Irwin: https://elkinsearthworks.com/irwin/

- Thermo Scientific TVA2020 Toxic Vapor Analyzer: https://www.thermofisher.com/order/catalog/product/TVA2020#/TVA2020

CALIBRATION GASES

Calibration gases are used to calibrate the methane detector to a known value. The calibration gas is the reference compound at a known concentration approximately equal to the leak definition concentration. Under NSPS/NESHAP regulations, the reference compound is methane and the leak definition concentration is 500 parts per million by volume (ppmv).

Two (2) gas mixtures are required for instrument calibration and performance evaluation:

1. Zero Gas. Air, less than 10 ppmv VOC. Outdoor ambient air shall not be substituted in place of zero air gas.

2. Calibration Gas. The calibration gas must be methane, diluted to a nominal concentration of 500 parts per million in air.

Each cylinder gas must be provided with a Certificate of Analysis. The Certificate of Analysis provides the analytical accuracy and the product expiration date. The Certificate of Analysis for all calibration gasesused for calibration of the instrument will be provided in the final report submitted each quarter.

CALIBRATION AND BACKGROUND READINGS

Below are the standard guidelines for calibrating and assessing the performance of the monitoring instrument. Calibration must be completed per the manufacturer's guidelines and Method 21. In the event of a conflict between Method 21 and the manufacturer's guidelines, Riverbend must comply with Method 21 requirements. The technician should ensure that a copy of the operating manual is available to reference.

The calibration procedures below must be completed each day of sampling, prior to beginning monitoring. A separate calibration form (Attachment B) must be completed for each day of sampling including rechecks.

STANDARD CALIBRATION PROCEDURES

STEP 1: ASSEMBLE INSTRUMENT, POWER ON AND WARM UP

Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments. Check all filters and the probe tip for any blockages. Visually check all tubing and wiring for any cracks or perforations. Ensure that the pump is running at the proper flow rate. Ensure that the instrument has been fully charged and has a sufficient supply of fuel (i.e., hydrogen).

While the instrument is warming up, the technician should provide the meteorological conditions during the day of the monitoring on page 2 of the calibration forms shown in Attachment B.

STEP 2: RESPONSE FACTOR

The response factor for methane must be determined for the instrument that is being utilized in the monitoring.[3] The technician should consult the manufacturer specifications or operating manual for this information. If necessary, the response factor should be input into the instrument prior to calibrating the instrument. If a response factor is not specified by the manufacturer, then the response factor determination specified in section 8.1.1.1 of Method 21 will need to be conducted prior to placing the unit into service. The technician should note that the use of a portable analyzer that has a response factor of greater than 10 for methane is not allowed under Method 21. Methane typically has a response factor of 1.0 for most flame ionization detector (FID) models.

STEP 3: CALIBRATION OF INSTRUMENT (EACH TIME BEFORE USE)

After the appropriate warm-up period, navigate to the instrument calibration menu to begin the calibration procedure. Introduce the zero-air gas into the instrument sample probe by one of two methods: 1) Connect probe to cylinder regulator via tubing; or, 2) Connect probe to Tedlar bag via tubing. Allow the meter reading to stabilize (or adjust the meter readout to correspond to the zero-air gas value) prior to accepting the zero internal calibration result.

Next, introduce the 500 ppmv calibration gas into the instrument sample probe by one of two methods: 1) Connect probe to cylinder regulator via tubing; or, 2) Connect probe to Tedlar bag via tubing. Allow the meter reading to stabilize (or adjust the meter readout to correspond to the calibration gas value) prior to accepting the calibration gas result. After calibration is complete, the technician should place the instrument into “run mode” and conduct a quick check of the instrument by re-introducing the calibration gas and recording the steady reading on page 2 of the calibration sheets shown in Attachment B.

The technician should also record the lot numbers of both calibration gases along with the corresponding expiration dates on page 1 of the calibration sheets shown in Attachment B.

STEP 4: CALIBRATION PRECISION (EVERY 3 MONTHS)

The calibration precision test must be completed prior to commencement of monitoring activities.

Make a total of three (3) trial measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage. The calibration precision can be calculated using this formula:

$$\text{Precision} = \frac{[|T_1|-C_{span}]+[|T_2-C_{span}|]+[|CT_3-{span}|]}{3} \times \frac{1}{C_{span}} \times \frac{100}{1}$$

Where,

C_{span} = Concentration of calibration gas (ppm_v)

T_1, T_2, and T_3 = Actual meter reading (ppm_v) for Trials 1, 2 and 3 respectively

The calibration precision shall be equal to or less than 10 percent of the calibration gas value. All meter readings should be entered on page 1 of the calibration sheets shown in Attachment B.

STEP 5: RESPONSE TIME (ONCE BEFORE NEW COMMISSIONING)

The response time test is required before commencement of monitoring activities. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

- Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading using a stopwatch (or other method). Perform this test sequence three (3) times and record the results. Calculate the average response time.

The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe (with straight extension or attached to a wheel), and probe filter that will be used during testing shall all be in place during the response time determination. All readings should be entered on page 1 of the calibration sheets shown in Attachment B.

STEP 6: UPWIND/DOWNWIND READINGS (BEFORE EACH USE)

To complete the calibration procedure, upwind and downwind readings must be taken. These readings will be used as the baseline in determining exceedances on the monitoring path.

1. Confirm the landfill waste boundary with the Area Air Program Specialist or Site Operations.
2. Determine the wind direction. This will vary day to day, sometimes hour to hour.
3. Go to the upwind location to take the Upwind Reading outside the waste boundary of the landfill at a distance of at least 30 meters (98 feet) from the edge of waste. Record the reading on page 2 of the calibration forms provided in Attachment B.
4. Then go to the downwind location to take the Downwind Reading outside the waste boundary of the landfill at a distance of at least 30 meters (98 feet) from the edge of waste. Record the reading on page 2 of the calibration forms provided in Attachment B.

If an area more than 30 meters (98 feet) outside the edge of waste is not accessible, review proper location with Area Air Program Specialist for the landfill location. (The regulation specifies that the background readings shall be taken 30 meters (98 feet) outside of perimeter wells; however, care must be taken since toe drains could be present)

The average of the upwind reading and the downwind reading will be considered the background concentration. The NSPS/NESHAP exceedance limit is expressed as 500 ppmv above background levels. For example, if the background concentration is 5.0 ppmv, then the meter readout threshold for a surface monitoring exceedance is 505 ppmv (not 500 ppmv).

The initial calibration procedures are now complete, and sampling of the monitoring route can begin. Follow the procedures set forth below in the “Monitoring Procedures” section of this Protocol.

SCHEDULING OF MONITORING EVENT

SEM Events are coordinated with the Area Air Program Specialist, District Operations Manager/Supervisor, as well as the site LFG Technician and/or Area Gas Operations Manager. Site operations will prepare the landfill for the monitoring event (i.e., have the site mowed, etc.), if necessary. Site vegetation should be at a reasonable height so that monitoring path can be followed, and the monitoring probe can be properly positioned within 2 to 4 inches from the surface.

SEM Events are to be conducted during typical meteorological conditions.

MONITORING PROCEDURES

SURFACE EMISSIONS MONITORING

Riverbend Landfill conducts penetration monitoring as a separate event using the site specific penetration map (see Penetration Monitoring section).

The general procedures for surface emissions monitoring performed by third-party consultants include the following.

1. SEM technicians must be trained (see SEM Training section).
2. Third party technicians must check in at the landfill office and with the site LFG technician.
3. Personal Protective Equipment (PPE) is required while working outside of the office. PPE complement is as follows: high visibility clothing or vest, three gas personal monitor, hardhat, safety glasses, puncture resistant steel toed work boots.
4. Monitoring must be performed during typical meteorological conditions and include the meteorological data in the event report.
5. Prepare the instrument for use by conducting all the Calibration Procedures listed above.
6. Using the Surface Emissions Route Map, begin monitoring, by taking a reading at the starting location and begin the geospatial and temporal GPS log of the actual monitoring path.
7. Walk the route as delineated on the Surface Emissions Route Map while continuing to observe the meter readout and keeping the probe inlet at a height of 2 to 4 inches above the landfill surface.
8. Section 8.3.1 of Method 21 states: "If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for two times the instrument response time."
9. If visual observations by the technician along the surface route indicate signs of elevated

concentrations of LFG, such as distressed vegetation, cracks, seeps, or significant odor, the technician will deviate from the route to take a reading at that location. Once the area that has been visually identified has been measured, the technician must immediately return to the monitoring route and continue monitoring.

10. After completion of each monitoring day, meet to review events of the day, download monitoring data and assist in preparing the exceedance log (Attachment C).

PENETRATION MONITORING

Riverbend Landfill is subject to 40 CFR §60.763(d) of Subpart XXX and 40 CFR §63.1958(d) of the NESHAP AAAA, which require the monitoringof all cover penetrations and openings.

NESHAP AAAA includes a definition of cover penetration and for purposes of conducting SEM, Riverbend Landfill will use the following definition:

Cover penetration *means a wellhead, a part of a landfill gas collection, leachate system or operations system, and/or any other object that completely passes through the landfill cover. The landfill cover includes that portion which covers the waste, as well as the portion which borders the waste extended to the point where it is sealed with the landfill liner or the surrounding land mass. Examples of what is not a penetration for purposes of this subpart include but are not limited to:Survey stakes, fencing including litter fences, flags, signs, utility posts, and trees so long as theseitems do not pass through the landfill cover.*

For the monitoring requirement requiring the monitoring of “any openings”, Riverbend Landfill defines “openings” to mean any cover penetration as defined above, and any area where waste has been placed that visually exhibits distressed vegetation and cracks and seeps inthe cover.

For actual penetration monitoring, the penetration will be monitored 2 to 4 inches above ground level. Monitoring will be done around the circumference at the base of each penetration location, as well as at areas of distressed vegetation and cracks and seeps. Any exceedance detected at a penetration will be labeled as a single penetration exceedance on the corresponding well number.

MONITORED EXCEEDANCE LOCATIONS

As discussed in 40 CFR §60.765(c)(4) and 40 CFR §63.1960(c)(4), any reading of 500 parts per million by volume (ppmv) or more above the background concentration at any location shall be recorded as a monitored exceedance.

If the technician monitors a location and the reading exceeds 500 ppmv, the location must be marked in the field and documented. The following procedure is to be completed at each monitored exceedance location.

1. Label brightly colored pin flags with a unique ID. Use several pin flags to denote the entire area of the exceedance. For Sites subject to 40 CFR 60, Subpart XXX and 40 CFR 63 Subpart AAAA, the exceedance location should be recorded using a GPS locator that is accurate to at least 4 meters (latitude and longitude coordinates must contain five decimal places).
2. Technician will record the flag number and the GPS coordinates on the field log.
3. Technician will note on the route map and field log the location of the exceedance including the label ID and the concentration recorded at that point.
4. Upon completion of each day's monitoring events, provide the monitored exceedances, monitoring data, their concentrations,
5. If repairs have been completed at an exceedance location during the same monitoring event, the technician will return to the repaired location(s) and conduct the 10-day follow-up monitoring event.
6. Ensure instrument is re-calibrated for each new day of follow-up monitoring.

Consult the USEPA flow chart at the beginning of this document and follow the steps in the next section for all monitoring exceedance locations.

EXCEEDANCE REPAIR PROCEDURES

Cover maintenance or adjustments to the GCCS will be made and the location will be re-monitored within 10 calendar days of the initial exceedance. The following will be completed for all surface, penetration, exceedances.

1. Exceedance Log will be updated that includes the following;
    - Date, Time, Exceedance ID, Description, GPS Location, Corrective Actions and Follow-Up Monitoring (10-day, 1-month, etc.)

A proposed corrective action plan and corresponding timeline will be submitted to the Administrator for approval for any location where monitored methane concentration equals or exceeds 500 ppmv above background three times within a quarterly period, except for when the exceedance will be corrected within 120-days by the addition of a new well or collection device.

MONITORED EXCEEDANCE RECHECKS

As required by 40 CFR §60.765(c)(4) and 40 CFR §63.1960(c)(4), any reading of 500 ppmv or more above the background concentration shall be recorded as a monitoredexceedance and specified corrective actions shall be taken. These regulations require that the monitored exceedance locations be re-monitored within ten (10) days and one (1) month of detecting the exceedance. Each re-monitoring event is detailed below. Also note that if the specified actions are taken, the exceedance is not a violation of the operational requirements of 40 CFR §60.763(d) or 40 CFR §63.1958(d).

The Area Air Program Specialist will develop a calendar for the re-monitoring events based on the date monitored. Reasonable efforts will be made to correct any monitored exceedance locations on the same day as the initial monitoring event. Riverbend Landfill or its contractors will complete corrective action measures that include and are not limited to cover repairs; or adjustments to the landfill gas collection and control system at each monitored exceedance location. Adjustments to the LFG system include and are not limited to increasing the vacuum of adjacent wells to increase the gas collection in the vicinity; fixing leaks; replacing bolts; installing boots; upgrading the blower, header pipes, or control device; etc. Root cause analysis as required by 40 CFR § 60.765 will be conducted for positive pressure and wellhead temperature exceedances.

10-Day RE-MONITORING

The locations of monitored exceedances are to be re-monitored within 10 calendar days of detecting the exceedance. All calibration procedures must be completed for each 10-day re-monitoring event.

- PASS: If the 10-day re-monitoring event shows methane concentrations at the monitored exceedance locations to be less than 500 ppm_v above the background, then the monitored exceedance locations are to be re-monitored one (1) month from the initial exceedance.

- FAIL: If the 10-day re-monitoring shows methane concentrations at the monitored exceedance locations to be greater than 500 ppmv above the background, then a second monitored exceedance has occurred. A second monitored exceedance requires additional corrective action be taken to remedy the exceedance. Corrective action measures include and are not limited to additional cover maintenance, additional adjustments to the LFG system.

  After completion of the additional corrective action, the second monitored exceedance location must be monitored within 10-days of the date of the second monitored exceedance. See Exceedance Repair Procedures for required documentation

  - PASS: If the 10-day re-monitoring for the second monitored exceedance location shows a methane concentration less than 500 ppmv above the background, then the second monitored exceedance must be re-monitored one (1) month from the initial exceedance. This location must then pass the 1-month follow-up to avoid three exceedances within the same quarter, which would prompt the 120-day corrective action period described in 40 CFR §60.765(c)(4)(v) and 40 CFR §63.1960(c)(4)(v). 10-day passing result will be entered into the exceedance log.

- FAIL: If the 10-day re-monitoring for the second monitored exceedance location shows a methane concentration greater than 500 ppmv above the background, then a new well or other collection device shall be installed at that location within 120 calendar days of the initial exceedance. (Note that an alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval if the exceedance is not corrected). No further monitoring is required at that exceedance location until the new well or other collection device has been installed. Second exceedance result will be entered into the exceedance log.

1-MONTH RE-MONITORING

The locations of monitored exceedances are to be re-monitored within 1 month of detecting the initial exceedance. All calibration procedures must be completed for each 1-month re-monitoring event.

- PASS: If the 1-month re-monitoring shows methane concentrations at the monitored exceedance locations to be less than 500 ppmv above the background, then no further monitoring of that monitored exceedance location is required until the next quarterly monitoring period. Results will be entered into the exceedance log.

- FAIL: If the 1-month re-monitoring shows methane concentrations at the monitored exceedance locations to be greater than 500 ppmv above the background and a second monitored exceedance has occurred,[6] the location requires additional corrective action to remedy the exceedance. Corrective action measures may include and are not limited to additional cover maintenance, additional adjustments to the LFG system, etc. After completionof the additional corrective action, the second monitored exceedance location is to be monitored within 10-days of the date of the second monitored exceedance.

    - PASS; If the 1-month re-monitoring for the second monitored exceedance location shows a methane concentration less than 500 ppmv above the background, then no further monitoring of that monitored exceedance location is required until the next quarterly monitoring period.
    - FAIL; If the 1-month re-monitoring for the second monitored exceedance location shows a methane concentration greater than 500 ppmv above the background, then a new well or other collection device shall be installed at that location within 120 calendar days of the initial exceedance. (Note that an alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval). No further monitoring is required at that exceedance location until the new well or other collection device has been installed.

The results of the follow-up monitoring will be documented on the exceedance log.

If an initial exceedance location fails the 10-day follow-up, passes the 20-day follow-up and fails the 1-month follow-up, this would constitute 3 exceedances within the same quarter, prompting the 120-day corrective action period described in 40 CFR 60.765(c)(4)(v).

Riverbend Landfill reports results of the 1st and 2nd quarter SEM events in the Semi-Annual Title V report and the 3rd and 4th quarters SEM Events in the Annual Title V reports. The Semi-Annual and Annual Title V reports are sent to Oregon Department of Environmental Quality and during the year after the effective date of the Administrative Compliance Order on Consent, Docket Number CAA-10-2021-0055, individual quarterly SEM event reports must be sent to EPA Region 10 60 days after the last monitored exceedance date. The SEM Report includes the following components:

COVER LETTER

The cover letter includes text explaining when the monitoring was completed, what equipment was used to complete the monitoring, what regulations were followed while completing the monitoring, corrective actions taken on any monitored exceedances, as well as the results from the monitoring. The following information outlined below should be included with the cover letter.

FIGURE 1 SITE PLAN

An overall site map depicting the approved SEM monitoring path imposed on the site map, exceedance locations includinglabel IDs, and upwind/downwind locations. This map also delineates the dangerous areas that were excluded from the monitoring.

TABLE 1 – SURFACE/PENETRATION/ MONITORING EXCEEDANCES AND CORRECTIVE ACTIONS

Table 1 contains a summary of the exceedances detected during the initial scan and any re-monitoring events conducted at the site as part of the monitoring event. Also included is a summary of corrective actions implemented at each location.

- All locations measured at or above 500 ppmv above background during the initial monitoring event must be included in this table. Concentrations must be reported as numerical values for monitoring points that are 500 ppmv above background or greater.
- An "NA" is placed in any Cell that does not apply or the cell is greyed out.
- If there are no exceedances detected for a quarterly SEM event, then Table 1 can be omitted from the report.

ATTACHMENT 1 – CALIBRATION RECORDS

Attachment 1 of the SEM report provides all the calibration forms for each daily monitoring event (this includes the initial monitoring event and all follow-up events).

ATTACHMENT 2 – CALIBRATION GASES CERTIFICATES OF ANALYSIS

Attachment 2 of the report consists of copies of the certificates of analysis for the calibration gases used to complete the initial monitoring and any associated rechecks.

ATTACHMENT A

SURFACE EMISSIONS MONITORING REFERENCE STANDARDS

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. To see a complete version including any recent edits, visit: https://www.ecfr.gov/cgi-bin/ECFR?page=browse and search under Title 40, Protection of Environment.

METHOD 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1.0 Scope and Application

1.1 Analytes.

Analyte	CAS No.
Volatile Organic Compounds (VOC)	No CAS number assigned.

1.2 Scope. This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 6.0. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

3.0 Definitions

3.1 *Calibration gas* means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

3.2 *Calibration precision* means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

3.3 *Leak definition concentration* means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

3.4 *No detectable emission* means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentration, that is less than 2.5 percent of the specified leak definition concentration. that indicates that a VOC emission (leak) is not present.

3.5 *Reference compound* means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.)

3.6 *Response factor* means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

3.7 *Response time* means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Pollutants. Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (*e.g.,* heptane) or may be toxic (*e.g.,* benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions can be found in reference documents, such as reference No. 4 in Section 16.0.

6.0 Equipment and Supplies

A VOC monitoring instrument meeting the following specifications is required:

6.1 The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

6.2 The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

6.3 The scale of the instrument meter shall be readable to ±2.5 percent of the specified leak definition concentration.

6.4 The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft^3 /min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

6.5 The instrument shall be equipped with a probe or probe extension or sampling not to exceed 6.4 mm (1/4in) in outside diameter, with a single end opening for admission of sample.

6.6 The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

7.0 Reagents and Standards

7.1 Two gas mixtures are required for instrument calibration and performance evaluation:

7.1.1 Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.

7.1.2 Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

7.2 Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

7.3 Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2 percent. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

7.4 Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Instrument Performance Evaluation. Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments.

8.1.1 Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

8.1.1.1 Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

8.1.1.2 The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

8.1.1.3 Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in References 1–3 of Section 17.0.

8.1.2 Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

8.1.2.1 Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

8.1.2.2 The calibration precision shall be equal to or less than 10 percent of the calibration gas value.

8.1.3 Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

8.1.3.1 Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

8.1.3.2 The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

8.2 Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

8.3 Individual Source Surveys.

8.3.1 Type I—Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

8.3.1.1 Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

8.3.1.2 Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

8.3.1.3 Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

8.3.1.4 Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

8.3.1.5 Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

8.3.1.6 Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.7 Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.8 Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

8.3.2 Type II—"No Detectable Emission". Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined in Section 8.3.1. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

8.3.2.1 Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described in Section 8.3.2.

8.3.2.2 Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices. If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described in Section 8.3.2 shall be used to determine if detectable emissions exist.

8.3.3 Alternative Screening Procedure.

8.3.3.1 A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of Section 8.3.1 or 8.3.2.

8.3.3.2 Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques of Section 8.3.1 or 8.3.2 shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

9.0 Quality Control

Section	**Quality control measure**	**Effect**
8.1.2	Instrument calibration precision check	Ensure precision and accuracy, respectively, of instrument response to standard.
10.0	Instrument calibration	

10.0 Calibration and Standardization

10.1 Calibrate the VOC monitoring instrument as follows. After the appropriate warm-up period and zero internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value.

Note: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.

11.0 Analytical Procedures[Reserved]

12.0 Data Analyses and Calculations[Reserved]

13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

1. Dubose, D.A., and G.E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81051. September 1981.

2. Brown, G.E., *et al.* Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–022. May 1981.

3. DuBose, D.A. *et al.* Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–110. September 1981.

4. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data[Reserved]

(b) After the installation of a collection and control system in compliance with § 60.755, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in § 60.752(b)(2)(v), using the following equation:

$M_{NMOC} = 1.89 \times 10^{-3} Q_{LFG} C_{NMOC}$

where,

M_{NMOC} = mass emission rate of NMOC, megagrams per year

Q_{LFG} = flow rate of landfill gas, cubic meters per minute

C_{NMOC} = NMOC concentration, parts per million by volume as hexane

(1) The flow rate of landfill gas, Q_{LFG}, shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of section 4 of Method 2E of appendix A of this part.

(2) The average NMOC concentration, C_{NMOC}, shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18 of appendix A of this part. If using Method 18 of appendix A of this part, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C of appendix A of this part by six to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the Administrator.

(c) When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this subpart shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in §§ 51.166 or 52.21 of this chapter using AP-42 or other approved measurement procedures.

(d) For the performance test required in § 60.752(b)(2)(iii)(B), Method 25, 25C, or Method 18 of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 60.752(b)(2)(i)(B). Method 3 or 3A shall be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. If using Method 18 of appendix A of this part, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The following equation shall be used to calculate efficiency:

Control Efficiency = $(NMOC_{in} - NMOC_{out})/(NMOC_{in})$

where,

$NMOC_{in}$ = mass of NMOC entering control device

$NMOC_{out}$ = mass of NMOC exiting control device

(e) For the performance test required in § 60.752(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 60.18(f)(4).

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32751, June 16, 1998; 65 FR 18908, Apr. 10, 2000; 65 FR 61778, Oct. 17, 2000; 71 FR 55127, Sept. 21, 2006]

§ 60.755 Compliance provisions.

(a) Except as provided in § 60.752(b)(2)(i)(B), the specified methods in paragraphs (a)(1) through (a)(6) of this section shall be used to determine whether the gas collection system is in compliance with § 60.752(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 60.752(b)(2)(ii)(A)(*1*), one of the following equations shall be used. The k and L_o kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 60.754(a)(4), the value of k determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

$$Q_m = 2L_o R \left(e^{-kc} - e^{-kt}\right)$$

where,

Q_m = maximum expected gas generation flow rate, cubic meters per year

L_o = methane generation potential, cubic meters per megagram solid waste

R = average annual acceptance rate, megagrams per year

k = methane generation rate constant, $year^{-1}$

t = age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years

c = time since closure, years (for an active landfill c = O and $e^{-kc} = 1$)

(ii) For sites with known year-to-year solid waste acceptance rate:

where,

Q_M = maximum expected gas generation flow rate, cubic meters per year

k = methane generation rate constant, $year^{-1}$

L_o = methane generation potential, cubic meters per megagram solid waste

M_i = mass of solid waste in the i^{th} section, megagrams

t_i = age of the i^{th} section, years

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in paragraphs (a)(1) (i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using the equations in paragraphs (a)(1) (i) or (ii) or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 60.752(b)(2)(ii)(A)(*2*), the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 60.752(b)(2)(ii)(A)(*3*), the owner or operator shall measure gauge pressure in the gas collection header at each individual well, monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within

5 calendar days, except for the three conditions allowed under § 60.753(b). If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.

(4) Owners or operators are not required to expand the system as required in paragraph (a)(3) of this section during the first 180 days after gas collection system startup.

(5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in § 60.753(c). If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.

(6) An owner or operator seeking to demonstrate compliance with § 60.752(b)(2)(ii)(A)(*4*) through the use of a collection system not conforming to the specifications provided in § 60.759 shall provide information satisfactory to the Administrator as specified in § 60.752(b)(2)(i)(C) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 60.753(a), each owner or operator of a controlled landfill shall place each well or design component as specified in the approved design plan as provided in § 60.752(b)(2)(i). Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade.

(c) The following procedures shall be used for compliance with the surface methane operational standard as provided in § 60.753(d).

(1) After installation of the collection system, the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring shall be performed in accordance with section 4.3.1 of Method 21 of appendix A of this part, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4) (i) through (v) of this section shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 60.753(d).

(i) The location of each monitored exceedance shall be marked and the location recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance shall be made and the location shall be re-monitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section shall be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4) (ii) or (iii) of this section shall be re-monitored 1 month from the initial exceedance. If the 1-month remonitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month remonitoring shows an exceedance, the actions specified in paragraph (c)(4) (iii) or (v) shall be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section shall comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer shall meet the instrument specifications provided in section 3 of Method 21 of appendix A of this part, except that "methane" shall replace all references to VOC.

(2) The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 3.1.3 of Method 21 of appendix A of this part, the instrument evaluation procedures of section 4.4 of Method 21 of appendix A of this part shall be used.

(4) The calibration procedures provided in section 4.2 of Method 21 of appendix A of this part shall be followed immediately before commencing a surface monitoring survey.

(e) The provisions of this subpart apply at all times, except during periods of start-up, shutdown, or malfunction, provided that the duration of start-up, shutdown, or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices.

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32752, June 16, 1998]

§ 60.756 Monitoring of operations.

Except as provided in § 60.752(b)(2)(i)(B),

(a) Each owner or operator seeking to comply with § 60.752(b)(2)(ii)(A) for an active gas collection system shall install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 60.755(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as provided in § 60.755(a)(5); and

(3) Monitor temperature of the landfill gas on a monthly basis as provided in § 60.755(a)(5).

(b) Each owner or operator seeking to comply with § 60.752(b)(2)(iii) using an enclosed combustor shall calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment.

(1) A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of ±1 percent of the temperature being measured expressed in degrees Celsius or ±0.5 degrees Celsius, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity equal to or greater than 44 megawatts.

(2) A device that records flow to or bypass of the control device. The owner or operator shall either:

(i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(c) Each owner or operator seeking to comply with § 60.752(b)(2)(iii) using an open flare shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame.

(2) A device that records flow to or bypass of the flare. The owner or operator shall either:

of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (AP-42) or other approved measurement procedures.

(d) For the performance test required in § 60.762(b)(2)(iii)(B), Method 25 or 25C (Method 25C may be used at the inlet only) of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20 parts per million by volume outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 60.767(c)(2). Method 3, 3A, or 3C must be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. Method 18 may be used in conjunction with Method 25A on a limited basis (compound specific, *e.g.,* methane) or Method 3C may be used to determine methane. The methane as carbon should be subtracted from the Method 25A total hydrocarbon value as carbon to give NMOC concentration as carbon. The landowner or operator must divide the NMOC concentration as carbon by 6 to convert from the CNMOC as carbon to CNMOC as hexane. Equation 4 must be used to calculate efficiency:

Where:

$NMOC_{in}$ = Mass of NMOC entering control device.

$NMOC_{out}$ = Mass of NMOC exiting control device.

(e) For the performance test required in § 60.762(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 60.18(f)(4).

(1) Within 60 days after the date of completing each performance test (as defined in § 60.8), the owner or operator must submit the results of the performance tests, including any associated fuel analyses, required by § 60.764(b) or (d) according to § 60.767(i)(1).

(2) [Reserved]

§ 60.765 Compliance provisions.

(a) Except as provided in § 60.767(c)(2), the specified methods in paragraphs (a)(1) through (6) of this section must be used to determine whether the gas collection system is in compliance with § 60.762(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 60.762(b)(2)(ii)(C)(*1*), either Equation 5 or Equation 6 must be used. The methane generation rate constant (k) and methane generation potential (L_o) kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 60.764(a)(4), the value of k determined from the test must be used. A value of no more than 15 years must be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

Where:

Q_m = Maximum expected gas generation flow rate, cubic meters per year.

L_o = Methane generation potential, cubic meters per megagram solid waste.

R = Average annual acceptance rate, megagrams per year.

k = Methane generation rate constant, $year^{-1}$.

t = Age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years.

c = Time since closure, years (for an active landfill c = 0 and $e^{-kc} = 1$).

(ii) For sites with known year-to-year solid waste acceptance rate:

Where:

Q_M = Maximum expected gas generation flow rate, cubic meters per year.

k = Methane generation rate constant, $year^{-1}$.

L_o = Methane generation potential, cubic meters per megagram solid waste.

M_i = Mass of solid waste in the i^{th} section, megagrams.

t_i = Age of the i^{th} section, years.

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, Equation 5 or Equation 6 in paragraphs (a)(1)(i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using Equation 5 or Equation 6 in paragraphs (a)(1)(i) or (ii) of this section or other methods must be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 60.762(b)(2)(ii)(C)(2), the owner or operator must design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 60.762(b)(2)(ii)(C)(*3*), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well, monthly. If a positive pressure exists, action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under § 60.763(b). Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(i) If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to § 60.768(e)(3).

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in § 60.767(g)(7) as part of the next annual report. The owner or operator must keep records according to § 60.768(e)(4).

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 60.767(g)(7) and § 60.767(j). The owner or operator must keep records according to § 60.768(e)(5).

(4) [Reserved]

(5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must monitor each well monthly for temperature as provided in § 60.763(c). If a well exceeds the operating parameter for temperature, action must be initiated to correct the exceedance within 5 calendar days. Any attempted corrective

measure must not cause exceedances of other operational or performance standards.

(i) If a landfill gas temperature less than 55 degrees Celsius (131 degrees Fahrenheit) cannot be achieved within 15 calendar days of the first measurement of landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit) was first measured. The owner or operator must keep records according to § 60.768(e)(3).

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure or elevated temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit) or positive pressure. The owner or operator must submit the items listed in § 60.767(g)(7) as part of the next annual report. The owner or operator must keep records according to § 60.768(e)(4).

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 60.767(g)(7) and § 60.767(j). The owner or operator must keep records according to § 60.768(e)(5).

(6) An owner or operator seeking to demonstrate compliance with § 60.762(b)(2)(ii)(C)(*4*) through the use of a collection system not conforming to the specifications provided in § 60.769 must provide information satisfactory to the Administrator as specified in § 60.767(c)(3) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 60.763(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in § 60.767(c). Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) Five (5) years or more if active; or

(2) Two (2) years or more if closed or at final grade.

(c) The following procedures must be used for compliance with the surface methane operational standard as provided in § 60.763(d).

(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of Method 21 of appendix A of this part, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 60.763(d).

(i) The location of each monitored exceedance must be marked and the location and concentration recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be re-monitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device must be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section or § 60.764(a)(6) must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer must meet the instrument specifications provided in section 6 of Method 21 of appendix A of this part, except that “methane” replaces all references to “VOC”.

(2) The calibration gas must be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 8.1 of Method 21 of appendix A of this part, the instrument evaluation procedures of section 8.1 of Method 21 of appendix A of this part must be used.

(4) The calibration procedures provided in sections 8 and 10 of Method 21 of appendix A of this part must be followed immediately before commencing a surface monitoring survey.

(e) The provisions of this subpart apply at all times, including periods of startup, shutdown or malfunction. During periods of startup, shutdown, and malfunction, you must comply with the work practice specified in § 60.763(e) in lieu of the compliance provisions in § 60.765.

[81 FR 59368, Aug. 29, 2016, as amended at 85 FR 17261, Mar. 26, 2020]

§ 60.766 Monitoring of operations.

Except as provided in § 60.767(c)(2):

(a) Each owner or operator seeking to comply with § 60.762(b)(2)(ii)(C) for an active gas collection system must install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 60.765(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as follows:

(i) The nitrogen level must be determined using Method 3C, unless an alternative test method is established as allowed by § 60.767(c)(2).

(ii) Unless an alternative test method is established as allowed by § 60.767(c)(2), the oxygen level must be determined by an oxygen meter using Method 3A, 3C, or ASTM D6522-11 (incorporated by reference, see § 60.17). Determine the oxygen level by an oxygen meter using Method 3A, 3C, or ASTM D6522-11 (if sample location is prior to combustion) except that:

(A) The span must be set between 10 and 12 percent oxygen;

(B) A data recorder is not required;

(C) Only two calibration gases are required, a zero and span;

(D) A calibration error check is not required;

(E) The allowable sample bias, zero drift, and calibration drift are ±10 percent.

(iii) A portable gas composition analyzer may be used to monitor the oxygen levels provided:

Deviations for continuous emission monitors or numerical continuous parameter monitors must be determined using a 3-hour monitoring block average. Beginning no later than September 28, 2021, the collection and control system design plan may include for approval collection and control systems that include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping, or reporting provisions, as provided in § 63.1981(d)(2).

(b) If you own or operate a bioreactor that is located at an MSW landfill that is not permanently closed and has a design capacity equal to or greater than 2.5 million Mg and 2.5 million m^3, then you must meet the requirements of this subpart, including requirements in paragraphs (b)(1) and (2) of this section.

(1) You must comply with this subpart starting on the date you are required to install the gas collection and control system.

(2) You must extend the collection and control system into each new cell or area of the bioreactor prior to initiating liquids addition in that area.

(c) At all times, beginning no later than September 27, 2021, the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require the owner or operator to make any further efforts to reduce emissions if the requirements of this subpart have been achieved. Determination of whether a source is operating in compliance with operation and maintenance requirements will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

§ 63.1957 Requirements for gas collection and control system installation and removal.

(a) ***Operation.*** Operate the collection and control device in accordance with the provisions of §§ 63.1958, 63.1960, and 63.1961.

(b) ***Removal criteria.*** The collection and control system may be capped, removed, or decommissioned if the following criteria are met:

(1) The landfill is a closed landfill (as defined in § 63.1990). A closure report must be submitted to the Administrator as provided in § 63.1981(f);

(2) The gas collection and control system has been in operation a minimum of 15 years or the landfill owner or operator demonstrates that the gas collection and control system will be unable to operate for 15 years due to declining gas flow; and

(3) Following the procedures specified in § 63.1959(c), the calculated NMOC emission rate at the landfill is less than 50 Mg/yr on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart.

§ 63.1958 Operational standards for collection and control systems.

Each owner or operator of an MSW landfill with a gas collection and control system used to comply with the provisions of § 63.1957 must:

(a) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade;

(b) Operate the collection system with negative pressure at each wellhead except under the following conditions:

(1) A fire or increased well temperature. The owner or operator must record instances when positive pressure occurs in efforts to avoid a fire. These records must be submitted with the semi-annual reports as provided in § 63.1981(h);

(2) Use of a geomembrane or synthetic cover. The owner or operator must develop acceptable pressure limits in the design plan;

(3) A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes must be approved by the Administrator as specified in § 63.1981(d)(2);

(c) Operate each interior wellhead in the collection system as specified in 40 CFR 60.753(c), until the landfill owner or operator elects to meet the operational standard for temperature in paragraph (c)(1) of this section.

(1) Beginning no later than September 27, 2021, operate each interior wellhead in the collection system with a landfill gas temperature less than 62.8 degrees Celsius (145 degrees Fahrenheit).

(2) The owner or operator may establish a higher operating temperature value at a particular well. A higher operating value demonstration must be submitted to the Administrator for approval and must include supporting data demonstrating that the elevated parameter neither causes fires nor significantly inhibits anaerobic decomposition by killing methanogens. The demonstration must satisfy both criteria in order to be approved (*i.e.,* neither causing fires nor killing methanogens is acceptable).

(d)

(1) Operate the collection system so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan must be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.

(2) Beginning no later than September 27, 2021, the owner or operator must:

(i) Conduct surface testing using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in § 63.1960(d).

(ii) Conduct surface testing at all cover penetrations. Thus, the owner or operator must monitor any cover penetrations that are within an area of the landfill where waste has been placed and a gas collection system is required.

(iii) Determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.

(e) Operate the system as specified in § 60.753(e) of this chapter, except:

(1) Beginning no later than September 27, 2021, operate the system in accordance to § 63.1955(c) such that all collected gases are vented to a control system designed and operated in compliance with § 63.1959(b)(2)(iii). In the event the collection or control system is not operating:

(i) The gas mover system must be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere must be closed within 1 hour of the collection or control system not operating; and

(ii) Efforts to repair the collection or control system must be initiated and completed in a manner such that downtime is kept to a minimum, and the collection and control system must be returned to operation.

(2) [Reserved]

(f) Operate the control system at all times when the collected gas is routed to the system.

(g) If monitoring demonstrates that the operational requirements in paragraph (b), (c), or (d) of this section are not met, corrective action must be taken as specified in § 63.1960(a)(3) and (5) or (c). If corrective actions are taken as specified in § 63.1960, the monitored exceedance is not a deviation of the operational requirements in this section.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1959 NMOC calculation procedures.

(a) Calculate the NMOC emission rate using the procedures specified in § 60.754(a) of this chapter, except:

(1) ***NMOC emission rate.*** Beginning no later than September 27, 2021 the landfill owner or operator must calculate the NMOC emission rate using either Equation 1 provided in paragraph (a)(1)(i) of this section or Equation 2 provided in paragraph (a)(1)(ii) of this section. Both Equation 1 and Equation 2 may be used if the actual year-to-year solid waste acceptance rate is known, as specified in paragraph (a)(1)(i) of this section, for part of the life of the landfill and the actual year-to-year solid waste acceptance rate is unknown, as specified in paragraph (a)(1)(ii) of this

section, for part of the life of the landfill. The values to be used in both Equation 1 and Equation 2 are 0.05 per year for k, 170 cubic meters per megagram (m^3/Mg) for L_O, and 4,000 parts per million by volume (ppmv) as hexane for the C_{NMOC}. For landfills located in geographical areas with a 30-year annual average precipitation of less than 25 inches, as measured at the nearest representative official meteorologic site, the k value to be used is 0.02 per year.

(i)

(A) Equation 1 must be used if the actual year-to-year solid waste acceptance rate is known.

Where:

M_{NMOC} = Total NMOC emission rate from the landfill, Mg/yr.

k = Methane generation rate constant, year−1.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of solid waste in the ith section, Mg.

t_i = Age of the ith section, years.

C_{NMOC} = Concentration of NMOC, ppmv as hexane.

3.6 × 10−9 = Conversion factor.

(B) The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for M_i if documentation of the nature and amount of such wastes is maintained.

(ii)

(A) Equation 2 must be used if the actual year-to-year solid waste acceptance rate is unknown.

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.

L_o = Methane generation potential, m^3/Mg solid waste.

R = Average annual acceptance rate, Mg/yr.

k = Methane generation rate constant, $year^{-1}$.

t = Age of landfill, years.

C_{NMOC} = Concentration of NMOC, ppmv as hexane.

c = Time since closure, years; for active landfill c=0 and $e^{-kc} = 1$.

3.6×10^{-9} = Conversion factor.

(B) The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value of R, if documentation of the nature and amount of such wastes is maintained.

(2) ***Tier 1.*** The owner or operator must compare the calculated NMOC mass emission rate to the standard of 50 Mg/yr.

(i) If the NMOC emission rate calculated in paragraph (a)(1) of this section is less than 50 Mg/yr, then the landfill owner or operator must submit an NMOC emission rate report according to § 63.1981(c) and must recalculate the NMOC mass emission rate annually as required under paragraph (b) of this section.

(ii) If the calculated NMOC emission rate as calculated in paragraph (a)(1) of this section is equal to or greater than 50 Mg/yr, then the landfill owner must either:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months of the first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, according to paragraphs (b)(2)(ii) and (iii) of this section;

(B) Determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the Tier 2 procedures provided in paragraph (a)(3) of this section; or

(C) Determine a site-specific methane generation rate constant and recalculate the NMOC emission rate using the Tier 3 procedures provided in paragraph (a)(4) of this section.

(3) ***Tier 2.*** The landfill owner or operator must determine the site-specific NMOC concentration using the following sampling procedure. The landfill owner or operator must install at least two sample probes per hectare, evenly distributed over the landfill surface that has retained waste for at least 2 years. If the landfill is larger than 25 hectares in area, only 50 samples are required. The probes should be evenly distributed across the sample area. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator must collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using EPA Method 25 or 25C of appendix A-7 to part 60. Taking composite samples from different probes into a single cylinder is allowed; however, equal sample volumes must be taken from each probe. For each composite, the sampling rate, collection times, beginning and ending cylinder vacuums, or alternative volume measurements must be recorded to verify that composite volumes are equal. Composite sample volumes should not be less than one liter unless evidence can be provided to substantiate the accuracy of smaller volumes. Terminate compositing before the cylinder approaches ambient pressure where measurement accuracy diminishes. If more than the required number of samples are taken, all samples must be used in the analysis. The landfill owner or operator must divide the NMOC concentration from EPA Method 25 or 25C of appendix A-7 to part 60 by 6 to convert from C_{NMOC} as carbon to C_{NMOC} as hexane. If the landfill has an active or passive gas removal system in place, EPA Method 25 or 25C samples may be collected from these systems instead of surface probes provided the removal system can be shown to provide sampling as representative as the two sampling probe per hectare requirement. For active collection systems, samples may be collected from the common header pipe. The sample location on the common header pipe must be before any gas moving, condensate removal, or treatment system equipment. For active collection systems, a minimum of three samples must be collected from the header pipe.

(i) Within 60 days after the date of completing each performance test (as defined in § 63.7 of subpart A), the owner or operator must submit the results according to § 63.1981(l)(1).

(ii) The landfill owner or operator must recalculate the NMOC mass emission rate using Equation 1 or Equation 2 provided in paragraph (a)(1)(i) or (ii) of this section and use the average site-specific NMOC concentration from the collected samples instead of the default value provided in paragraph (a)(1) of this section.

(iii) If the resulting NMOC mass emission rate is less than 50 Mg/yr, then the owner or operator must submit a periodic estimate of NMOC emissions in an NMOC emission rate report according to § 63.1981(c) and must recalculate the NMOC mass emission rate annually as required under paragraph (b) of this section. The site-specific NMOC concentration must be retested every 5 years using the methods specified in this section.

(iv) If the NMOC mass emission rate as calculated using the Tier 2 site-specific NMOC concentration is equal to or greater than 50 Mg/yr, the landfill owner or operator must either:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months according to paragraphs (b)(2)(ii) and (iii) of this section; or

(B) Determine a site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the Tier 3 procedures specified in paragraph (a)(4) of this section.

(4) ***Tier 3.*** The site-specific methane generation rate constant must be determined using the procedures provided in EPA Method 2E of appendix A-1 to part 60 of this chapter. The landfill owner or operator must estimate the NMOC mass emission rate using Equation 1 or Equation 2 in paragraph (a)(1)(i) or (ii) of this section and using a site-

specific methane generation rate constant, and the site-specific NMOC concentration as determined in paragraph (a)(3) of this section instead of the default values provided in paragraph (a)(1) of this section. The landfill owner or operator must compare the resulting NMOC mass emission rate to the standard of 50 Mg/yr.

(i) If the NMOC mass emission rate as calculated using the Tier 2 site-specific NMOC concentration and Tier 3 site-specific methane generation rate is equal to or greater than 50 Mg/yr, the owner or operator must:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months of the first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, according to paragraphs (b)(2)(ii) and (iii) of this section.

(B) [Reserved]

(ii) If the NMOC mass emission rate is less than 50 Mg/yr, then the owner or operator must recalculate the NMOC mass emission rate annually using Equation 1 or Equation 2 in paragraph (a)(1) of this section and using the site-specific Tier 2 NMOC concentration and Tier 3 methane generation rate constant and submit a periodic NMOC emission rate report as provided in § 63.1981(c). The calculation of the methane generation rate constant is performed only once, and the value obtained from this test must be used in all subsequent annual NMOC emission rate calculations.

(5) ***Other methods.*** The owner or operator may use other methods to determine the NMOC concentration or a site-specific methane generation rate constant as an alternative to the methods required in paragraphs (a)(3) and (4) of this section if the method has been approved by the Administrator.

(b) Each owner or operator of an affected source having a design capacity equal to or greater than 2.5 million Mg and 2.5 million m^3 must either comply with paragraph (b)(2) of this section or calculate an NMOC emission rate for the landfill using the procedures specified in paragraph (a) of this section. The NMOC emission rate must be recalculated annually, except as provided in § 63.1981(c)(1)(ii)(A).

(1) If the calculated NMOC emission rate is less than 50 Mg/yr, the owner or operator must:

(i) Submit an annual NMOC emission rate emission report to the Administrator, except as provided for in § 63.1981(c)(1)(ii); and

(ii) Recalculate the NMOC emission rate annually using the procedures specified in paragraph (a)(1) of this section until such time as the calculated NMOC emission rate is equal to or greater than 50 Mg/yr, or the landfill is closed.

(A) If the calculated NMOC emission rate, upon initial calculation or annual recalculation required in paragraph (b) of this section, is equal to or greater than 50 Mg/yr, the owner or operator must either: comply with paragraph (b)(2) of this section or calculate NMOC emissions using the next higher tier in paragraph (a) of this section.

(B) If the landfill is permanently closed, a closure report must be submitted to the Administrator as provided for in § 63.1981(f).

(2) If the calculated NMOC emission rate is equal to or greater than 50 Mg/yr using Tier 1, 2, or 3 procedures, the owner or operator must either:

(i) Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year as specified in § 63.1981(d) or calculate NMOC emissions using the next higher tier in paragraph (a) of this section. The collection and control system must meet the requirements in paragraphs (b)(2)(ii) and (iii) of this section.

(ii) Collection system. Install and start up a collection and control system that captures the gas generated within the landfill as required by paragraphs (b)(2)(ii)(B) or (C) and (b)(2)(iii) of this section within 30 months after:

(A) The first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, unless Tier 2 or Tier 3 sampling demonstrates that the NMOC emission rate is less than 50 Mg.

(B) An active collection system must:

(*1*) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment;

(*2*) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade;

(*3*) Collect gas at a sufficient extraction rate; and

(*4*) Be designed to minimize off-site migration of subsurface gas.

(C) A passive collection system must:

(*1*) Comply with the provisions specified in paragraphs (b)(2)(ii)(B)(1), (2), and (3) of this section; and

(*2*) Be installed with liners on the bottom and all sides in all areas in which gas is to be collected. The liners must be installed as required under § 258.40 of this chapter.

(iii) Control system. Route all the collected gas to a control system that complies with the requirements in either paragraph (b)(2)(iii)(A), (B), or (C) of this section.

(A) A non-enclosed flare designed and operated in accordance with the parameters established in § 63.11(b) except as noted in paragraph (e) of this section; or

(B) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight-percent or reduce the outlet NMOC concentration to less than 20 ppmv, dry basis as hexane at 3-percent oxygen. The reduction efficiency or ppmv must be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the test methods specified in paragraph (e) of this section. The performance test is not required for boilers and process heaters with design heat input capacities equal to or greater than 44 megawatts that burn landfill gas for compliance with this subpart.

(*1*) If a boiler or process heater is used as the control device, the landfill gas stream must be introduced into the flame zone.

(*2*) The control device must be operated within the parameter ranges established during the initial or most recent performance test. The operating parameters to be monitored are specified in §§ 63.1961(b) through (e);

(C) A treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-British thermal unit (Btu) gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to either paragraph (b)(2)(iii)(A) or (B) of this section.

(D) All emissions from any atmospheric vent from the gas treatment system are subject to the requirements of paragraph (b)(2)(iii)(A) or (B) of this section. For purposes of this subpart, atmospheric vents located on the condensate storage tank are not part of the treatment system and are exempt from the requirements of paragraph (b)(2)(iii)(A) or (B) of this section.

(c) After the installation and startup of a collection and control system in compliance with this subpart, the owner or operator must calculate the NMOC emission rate for purposes of determining when the system can be capped, removed, or decommissioned as provided in § 63.1957(b)(3), using Equation 3:

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.

Q_{LFG} = Flow rate of landfill gas, m^3 per minute.

C_{NMOC} = Average NMOC concentration, ppmv as hexane.

1.89×10^{-3} = Conversion factor.

(1) The flow rate of landfill gas, Q_{LFG}, must be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control system using a gas flow measuring device calibrated according to the provisions of section 10 of EPA Method 2E of appendix A-1 of part 60.

(2) The average NMOC concentration, C_{NMOC}, must be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in EPA Method 25 or 25C of appendix A-7 to part 60 of this chapter. The sample location on the common header pipe must be before any condensate removal or other gas refining units. The landfill owner or operator must divide the NMOC concentration from EPA Method 25 or 25C of appendix A-7 to part 60 by 6 to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the Administrator.

(i) Within 60 days after the date of completing each performance test (as defined in § 63.7), the owner or operator must submit the results of the performance test, including any associated fuel analyses, according to § 63.1981(l)(1).

(ii) [Reserved]

(d) For the performance test required in § 63.1959(b)(2)(iii)(B), EPA Method 25 or 25C (EPA Method 25C of appendix A-7 to part 60 of this chapter may be used at the inlet only) of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20- ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 63.1981(d)(2). EPA Method 3, 3A, or 3C of appendix A-7 to part 60 must be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), EPA Method 25A should be used in place of EPA Method 25. EPA Method 18 may be used in conjunction with EPA Method 25A on a limited basis (compound specific, *e.g.,* methane) or EPA Method 3C may be used to determine methane. The methane as carbon should be subtracted from the EPA Method 25A total hydrocarbon value as carbon to give NMOC concentration as carbon. The landowner or operator must divide the NMOC concentration as carbon by 6 to convert from the C_{NMOC} as carbon to C_{NMOC} as hexane. Equation 4 must be used to calculate efficiency:

Where:

$NMOC_{in}$ = Mass of NMOC entering control device.

$NMOC_{out}$ = Mass of NMOC exiting control device.

(e) For the performance test required in § 63.1959(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 63.11(b)(6)(ii) is calculated from the concentration of methane in the landfill gas as measured by EPA Method 3C of appendix A to part 60 of this chapter. A minimum of three 30-minute EPA Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. EPA Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 63.11(b)(7) of subpart A.

(1) Within 60 days after the date of completing each performance test (as defined in § 63.7), the owner or operator must submit the results of the performance tests, including any associated fuel analyses, required by § 63.1959(c) or (e) according to § 63.1981(l)(1).

(2) [Reserved]

(f) The performance tests required in §§ 63.1959(b)(2)(iii)(A) and (B), must be conducted under such conditions as the Administrator specifies to the owner or operator based on representative performance of the affected source for the period being tested. Representative conditions exclude periods of startup and shutdown unless specified by the Administrator. The owner or operator may not conduct performance tests during periods of malfunction. The owner or operator must record the process information that is necessary to document operating conditions during the test and include in such record an explanation to support that such conditions represent normal operation. Upon request, the owner or operator shall make available to the Administrator such records as may be necessary to determine the conditions of performance tests.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1960 Compliance provisions.

(a) Except as provided in § 63.1981(d)(2), the specified methods in paragraphs (a)(1) through (5) of this section must be used to determine whether the gas collection system is in compliance with § 63.1959(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 63.1959(b)(2)(ii)(C)(1), either Equation 5 or Equation 6 must be used. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the Administrator. The methane generation rate constant (k) and methane generation potential (L_o) kinetic factors should be those published in the most recent *Compilation of Air Pollutant Emission Factors* (AP-42) or other site-specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 63.1959(a)(4), the value of k determined from the test must be used. A value of no more than 15 years must be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

Where:

Qm = Maximum expected gas generation flow rate, m^3/yr.

L_o = Methane generation potential, m^3/Mg solid waste.

R = Average annual acceptance rate, Mg/yr.

k = Methane generation rate constant, $year^{-1}$.

t = Age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years.

c = Time since closure, years (for an active landfill c = 0 and $e^{-kc} = 1$).

2 = Constant.

(ii) For sites with known year-to-year solid waste acceptance rate:

Where:

Qm = Maximum expected gas generation flow rate, m^3/yr.

k = Methane generation rate constant, $year^{-1}$.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of solid waste in the ith section, Mg.

t_i = Age of the ith section, years.

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, Equation 5 or Equation 6 in paragraphs (a)(1)(i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using Equation 5 or Equation 6 in paragraph (a)(1)(i) or (ii) of this section or other methods must be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 63.1959(b)(2)(ii)(B)(2), the owner or operator must design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 63.1959(b)(2)(ii)(B)(*3*), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well monthly. Any attempted corrective measure must not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval. If a positive pressure exists, follow the procedures as specified in § 60.755(a)(3), except:

(i) Beginning no later than September 27, 2021, if a positive pressure exists, action must be initiated to correct the exceedance within 5 days, except for the three conditions allowed under § 63.1958(b).

(A) If negative pressure cannot be achieved without excess air infiltration within 15 days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in § 63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(j). The owner or operator must keep records according to § 63.1983(e)(5).

(ii) [Reserved]

(4) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c), for the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must follow the procedures as specified in § 60.755(a)(5) of this chapter, except:

(i) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), the owner or operator must monitor each well monthly for temperature. If a well exceeds the operating parameter for temperature as provided in § 63.1958(c)(1), action must be initiated to correct the exceedance within 5 days. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(A) If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) was first measured. The owner or operator must keep records according to § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator must submit the items listed in § 63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(h)(7) and (j). The owner or operator must keep records according to § 63.1983(e)(5).

(D) If a landfill gas temperature measured at either the wellhead or at any point in the well is greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and the carbon monoxide concentration measured, according to the procedures in § 63.1961(a)(5)(vi) is greater than or equal to 1,000 ppmv the corrective action(s) for the wellhead temperature standard (62.8 degrees Celsius or 145 degrees Fahrenheit) must be completed within 15 days.

(5) An owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(ii)(B)(*4*) through the use of a collection system not conforming to the specifications provided in § 63.1962 must provide information satisfactory to the Administrator as specified in § 63.1981(d)(3) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 63.1958(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in § 63.1981(d). Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade.

(c) The following procedures must be used for compliance with the surface methane operational standard as provided in § 63.1958(d).

(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of EPA Method 21 of appendix A-7 of part 60 of this chapter, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.

(4) Any reading of 500 ppm or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 63.1958(d).

(i) The location of each monitored exceedance must be marked and the location and concentration recorded. Beginning no later than September 27, 2021, the location must be recorded using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be re-monitored within 10 days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period, a new well or other collection device must be installed within 120 days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer must meet the instrument specifications provided in section 6 of EPA Method 21 of appendix A of part 60 of this chapter, except that “methane” replaces all references to “VOC”.

(2) The calibration gas must be methane, diluted to a nominal concentration of 500 ppm in air.

(3) To meet the performance evaluation requirements in section 8.1 of EPA Method 21 of appendix A of part 60 of this chapter, the instrument evaluation procedures of section 8.1 of EPA Method 21 of appendix A of part 60 must be used.

(4) The calibration procedures provided in sections 8 and 10 of EPA Method 21 of appendix A of part 60 of this chapter must be followed immediately before commencing a surface monitoring survey.

(e)

(1) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standards in introductory paragraph § 63.1958(e), the provisions of this subpart apply at all times, except during periods of SSM, provided that the duration of SSM does not exceed 5 days for collection systems and does not exceed 1 hour for treatment or control devices. You must comply with the provisions in Table 1 to subpart AAAA that apply before September 28, 2021.

(2) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard in § 63.1958(e)(1), the provisions of this subpart apply at all times, including periods of SSM. During periods of SSM, you must comply with the work practice requirement specified in § 63.1958(e) in lieu of the compliance provisions in § 63.1960.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1961 Monitoring of operations.

Except as provided in § 63.1981(d)(2):

(a) Each owner or operator seeking to comply with § 63.1959(b)(2)(ii)(B) for an active gas collection system must install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 63.1960(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as follows:

(i) The nitrogen level must be determined using EPA Method 3C of appendix A-2 to part 60 of this chapter, unless an alternative test method is established as allowed by § 63.1981(d)(2).

(ii) Unless an alternative test method is established as allowed by § 63.1981(d)(2), the oxygen level must be determined by an oxygen meter using EPA Method 3A or 3C of appendix A-2 to part 60 of this chapter or ASTM D6522-11 (incorporated by reference, see § 63.14). Determine the oxygen level by an oxygen meter using EPA Method 3A or 3C of appendix A-2 to part 60 or ASTM D6522-11 (if sample location is prior to combustion) except that:

(A) The span must be set between 10- and 12-percent oxygen;

(B) A data recorder is not required;

(C) Only two calibration gases are required, a zero and span;

(D) A calibration error check is not required; and

(E) The allowable sample bias, zero drift, and calibration drift are ±10 percent.

(iii) A portable gas composition analyzer may be used to monitor the oxygen levels provided:

(A) The analyzer is calibrated; and

(B) The analyzer meets all quality assurance and quality control requirements for EPA Method 3A of appendix A-2 to part 60 of this chapter or ASTM D6522-11 (incorporated by reference, see § 63.14).

(3) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c), the owner or operator must follow the procedures as specified in § 60.756(a)(2) and (3) of this chapter. Monitor temperature of the landfill gas on a monthly basis as provided in § 63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter.

(4) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), monitor temperature of the landfill gas on a monthly basis as provided in § 63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter. Keep records specified in § 63.1983(e).

(5) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), unless a higher operating temperature value has been approved by the Administrator under this subpart or under 40 CFR part 60, subpart WWW; 40 CFR part 60, subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR part 60, subpart Cc or 40 CFR part 60, subpart Cf, you must initiate enhanced monitoring at each well with a measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) as follows:

(i) Visual observations for subsurface oxidation events (smoke, smoldering ash, damage to well) within the radius of influence of the well.

(ii) Monitor oxygen concentration as provided in paragraph (a)(2) of this section;

(iii) Monitor temperature of the landfill gas at the wellhead as provided in paragraph (a)(4) of this section.

(iv) Monitor temperature of the landfill gas every 10 vertical feet of the well as provided in paragraph (a)(6) of this section.

(v) Monitor the methane concentration with a methane meter using EPA Method 3C of appendix A-6 to part 60, EPA Method 18 of appendix A-6 to part 60 of this chapter, or a portable gas composition analyzer to monitor the methane levels provided that the analyzer is calibrated and the analyzer meets all quality assurance and quality control requirements for EPA Method 3C or EPA Method 18.

(vi) Monitor carbon monoxide concentrations, as follows:

(A) Collect the sample from the wellhead sampling port in a passivated canister or multi-layer foil gas sampling bag (such as the Cali-5-Bond Bag) and analyze that sample using EPA Method 10 of appendix A-4 to part 60 of this chapter, or an equivalent method with a detection limit of at least 100 ppmv of carbon monoxide in high concentrations of methane; and

(B) Collect and analyze the sample from the wellhead using EPA Method 10 of appendix A-4 to part 60 to measure carbon monoxide concentrations.

(vii) The enhanced monitoring this paragraph (a)(5) must begin 7 days after the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit); and

(viii) The enhanced monitoring in this paragraph (a)(5) must be conducted on a weekly basis. If four consecutive weekly carbon monoxide readings are under 100 ppmv, then enhanced monitoring may be decreased to monthly. However, if carbon monoxide readings exceed 100 ppmv again, the landfill must return to weekly monitoring.

(ix) The enhanced monitoring in this paragraph (a)(5) can be stopped once a higher operating value is approved, at which time the monitoring provisions issued with the higher operating value should be followed, or once the measurement of landfill gas temperature at the wellhead is less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit).

(6) For each wellhead with a measurement of landfill gas temperature greater than or equal to 73.9 degrees Celsius (165 degrees Fahrenheit), annually monitor temperature of the landfill gas every 10 vertical feet of the well. This temperature can be monitored either with a removable thermometer, or using temporary or permanent thermocouples installed in the well.

(b) Each owner or operator seeking to comply with § 63.1959(b)(2)(iii) using an enclosed combustor must calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment:

(1) A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of ±1 percent of the temperature being measured expressed in degrees Celsius or ±0.5 degrees Celsius, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity equal to or greater than 44 megawatts.

(2) A device that records flow to the control device and bypass of the control device (if applicable). The owner or operator must:

(i) Install, calibrate, and maintain a gas flow rate measuring device that must record the flow to the control device at least every 15 minutes; and

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(c) Each owner or operator seeking to comply with § 63.1959(b)(2)(iii) using a non-enclosed flare must install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame; and

(2) A device that records flow to the flare and bypass of the flare (if applicable). The owner or operator must:

(i) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the control device at least every 15 minutes; and

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(d) Each owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(iii) using a device other than a non-enclosed flare or an enclosed combustor or a treatment system must provide information satisfactory to the Administrator as provided in § 63.1981(d)(2) describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Administrator must review the information and either approve it, or request that additional information be submitted. The Administrator may specify additional appropriate monitoring procedures.

(e) Each owner or operator seeking to install a collection system that does not meet the specifications in § 63.1962 or seeking to monitor alternative parameters to those required by §§ 63.1958 through 63.1961 must provide information satisfactory to the Administrator as provided in § 63.1981(d)(2) and (3) describing the design and operation of the collection system, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Administrator may specify additional appropriate monitoring procedures.

(f) Each owner or operator seeking to demonstrate compliance with the 500-ppm surface methane operational standard in § 63.1958(d) must monitor surface concentrations of methane according to the procedures in § 63.1960(c) and the instrument specifications in § 63.1960(d). If you are complying with the 500-ppm surface methane operational standard in § 63.1958(d)(2), for location, you must determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters and the coordinates must be in decimal degrees with at least five decimal places. In the semi-annual report in § 63.1981(h), you must report the location of each exceedance of the 500-ppm methane concentration as provided in § 63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

(g) Each owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(iii)(C) using a landfill gas treatment system must calibrate, maintain, and operate according to the manufacturer's specifications a device that records flow to the treatment system and bypass of the treatment system (if applicable). Beginning no later than September 27, 2021, each owner or operator must maintain and operate all monitoring systems associated with the treatment system in accordance with the site-specific treatment system monitoring plan required in § 63.1983(b)(5)(ii). The owner or operator must:

(1) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the treatment system at least every 15 minutes; and

(2) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(h) The monitoring requirements of paragraphs (a), (b), (c), (d), and (g) of this section apply at all times the affected source is operating, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. You are required to complete monitoring system repairs in response to monitoring system malfunctions and to return the monitoring system to operation as expeditiously as practicable. Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c)(1), (d)(2), and (e)(1), the standards apply at all times.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64401, Oct. 13, 2020]

§ 63.1962 Specifications for active collection systems.

(a) Each owner or operator seeking to comply with § 63.1959(b)(2)(i) must site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing areas using the following procedures unless alternative procedures have been approved by the Administrator as provided in § 63.1981(d)(2) and (3):

(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

(3) The placement of gas collection devices determined in paragraph (a)(1) of this section must control all gas producing areas, except as provided by paragraphs (a)(3)(i) and (ii) of this section.

(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under § 63.1983(d). The documentation must provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area and must be provided to the Administrator upon request.

(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

(A) The NMOC emissions from each section proposed for exclusion must be computed using Equation 7:

Where:

Q_i = NMOC emission rate from the ith section, Mg/yr.

k = Methane generation rate constant, year^{-1}.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of the degradable solid waste in the ith section, Mg.

t_i = Age of the solid waste in the ith section, years.

C_{NMOC} = Concentration of NMOC, ppmv.

3.6×10^{-9} = Conversion factor.

(B) If the owner/operator is proposing to exclude, or cease gas collection and control from, nonproductive physically separated (*e.g.,* separately lined) closed areas that already have gas collection systems, NMOC emissions from each physically separated closed area must be computed using either Equation 3 in § 63.1959(c) or Equation 7 in paragraph (a)(3)(ii)(A) of this section.

ATTACHMENT B

SAMPLE CALIBRATION FORMS

SURFACE EMISSION CALIBRATION PRECISION TEST RECORD

CALIBRATION DATE: ______________________________
TIME:

EXPIRATION DATE (3 MOS.): ______________________________

INSTRUMENT MAKE: ______________________________
MODEL: ______________________________
S/N: ______________________________
Calibration Gas Lot #:
Calibration Gas Concentration (PPM):
Calibration Gas Expiration:

MEASUREMENT #1:

Meter Reading for Zero Air:	ppm (a)	______________
Meter Reading for Calibration Gas:	ppm (b)	______________

MEASUREMENT #2:

Meter Reading for Zero Air:	ppm (c)	______________
Meter Reading for Calibration Gas:	ppm (d)	______________

MEASUREMENT #3:

Meter Reading for Zero Air:	ppm (e)	______________
Meter Reading for Calibration Gas:	ppm (f)	______________

CALCULATE PRECISION: 500

$$\frac{[500 - (b)] + [500 - (d)] + [500 - (f)]}{3} \times \frac{1}{500} \times 100$$

% (must be less than 10%)

PERFORMED BY: ______________

SURFACE EMISSION RESPONSE TIME TEST RECORD

DATE: ______________________________
TIME:

INSTRUMENT MAKE: ______________________________
MODEL: ______________________________
S/N: ______________________________

MEASUREMENT #1:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (1)

MEASUREMENT #2:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (2)

MEASUREMENT #3:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (3)

CALCULATE PRECISION:

$$\frac{(1) + (2) + (3)}{3} =$$ seconds (MUST BE LESS THAN 30 SECONDS)

PERFORMED BY: _______________

SURFACE EMISSION
CALIBRATION PROCEDURE AND BACKGROUND DETERMINATION REPORT

INSTRUMENT MAKE: ______________________
MODEL: ______________________
S/N: ______________________

Calibration Procedure

1. Allow instrument to internally zero itself while introducing zero air.

2. Introduce calibration gas into the probe.
Stable reading = ____________ ppm

3. Adjust meter to read 500 ppm.

Background Determination Procedure

1. Upwind Reading (highest in 30 seconds): ____________ ppm (1)

2. Downwind Reading (highest in 30 seconds): ____________ ppm (2)

Calculate Background Value:

$$\frac{(1) + (2)}{2}$$

Background = ____________ ppm

PERFORMED BY:

____

Date: ______________________
Time: ____________

ATTACHMENT C

SAMPLE EXCEEDANCE LOG

Riverbend Landfill
Surface Emissions Monitoring
Summary of Exceedances

Initial Monitoring Event							Corrective Action		1st 10-day Follow-Up		1-Month Follow-Up		Extra 10-day Follow-Up		Extra 1-Month Follow-Up	
ID	Date	Type	Description	Longitude	Latitude	CH_4 (ppm)	Date	Description	Date	CH_4 (ppm)	Date	CH_4 (ppm)	Date	CH_4 (ppm)	Date	CH_4 (ppm)

LEGEND

- FINAL CONTOUR
- SURFACE EMISSIONS MONITORING ROUTE
- PERIMETER SURFACE EMISSIONS MONITORING ROUTE
- LANDFILL FOOTPRINT

FOR PERMITTING PURPOSES ONLY
NOT FOR CONSTRUCTION

NOTES:

1. TOPOGRAPHIC CONTOURS OBTAINED FROM GEOSPACIAL SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS OBTAINED ON MARCH 6, 2018. VERTICAL DATUM IS BASED ON NAVD88.
2. FINAL BUILDOUT BASED ON THE OCTOBER 2017 PLANS PROVIDED BY BULLSEYE DESIGN SERVICES, INC. (281-516-1794).
3. AS-BUILT LFG SYSTEM INFORMATION PROVIDED BY RIVERBEND AND LELAND MACDONALD & ASSOCIATES, LLC.

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765 FAX (704) 283-9755
CEC COA#: 1192731-91

OCTOBER 2018

WASTE MANAGEMENT

SURFACE EMISSIONS MONITORING ROUTE

RIVERBEND LANDFILL

APPENDIX D

NSPS DETERMINATION LETTERS AND STATE APPROVAL LETTERS

APPENDIX D-1

TEMPERATURE HOV CORRESPONDENCE AND PREVIOUSLY APPROVED HOVS

TECH FILE COPY
Do Not Remove
File # I.2

RIVERBEND LANDFILL COMPANY, INC.
A WASTE MANAGEMENT COMPANY

13469 S.W. Hwy. 18
McMinnville, OR 97128
(503) 472-8788
(503) 434-9770 Fax

December 15, 2000

Mr. Bob Barrows
Manager Solid Waste Programs, Western Area
Oregon Department of Environmental Quality
750 Front St. NE, Suite 120
Salem, Oregon 97310

RE: Landfill Gas Extraction Well Temperatures at the Riverbend Landfill, Yamhill County Oregon, Title V permit No.

Dear Mr. Barrows:

As I discussed with Mr. Gary L. Andes Condition No. 11.9 of Riverbend Landfill Company (RLC) Title V operating permit requires that all internal Landfill Gas (LFG) extraction wells be operated to maintain a temperature <55oC (equivalent to 131oF).

Based on information collected during our required well head monitoring RLC is requesting some latitude to operate individual well heads at a temperature above 55oC. Based on my conversations with other individuals familiar with operating active LFG collection systems it is not uncommon for LFG wells to exceed this temperature threshold. The reason these wells tend to be hotter is most likely due to accelerated biodegradation, resulting from climatic conditions (high moisture in waste), make up of the waste in the effected zone of the well, and age of the waste.

Based on continued methane, temperature, and oxygen readings, and observations around the extraction zone RLC is confident that these wells are being operated in a safe manner and at no time have shown evidence of a potential hazardous condition. However to comply with the regulations these wells have been partially closed. By slowly closing these wells off no significant reduction in temperature has been noted, and overall well field production has been reduced. By reducing the performance of the LFG collection system the potential for greater fugitive emissions is increased because a lower percentage of the methane being produced by the waste decomposition is collected.

In order to assure safe and effective operation of the LFG collection system RLC proposes the following.

- Compare temperature, methane, and oxygen measurements to previous measurements and verify other parameters are in compliance, and have not deviated significantly from previous readings. (i.e. a significant decrease in the methane reading may indicate consumption of the fuel by combustion occurring inside the waste, consistently increasing temperatures may also indicate combustion.)

- Make any necessary adjustments to the wellhead for percent methane, and percent oxygen.
- Measure and record percent Carbon Monoxide (CO) which is a byproduct of combustion. This will be performed to verify that there is no combustion of fuels occurring within the landfill in the effective zone of the LFG collection well in question. CO measurements will be collected utilizing "Dregger Tubes". The Dregger Tube will be calibrated to read from 0-1000 parts per million (ppm) CO. These readings are expected to show some level of CO existing in the LFG resulting from of normal processes that occur during the decomposition waste that creates methane.

Once it has been verified that hazardous conditions due to above permitted well temperatures do not exist RLC will continue to monitor and adjust the well head based on other parameters (vacuum, percent methane, percent oxygen), and will continue to verify the absence of high CO readings on a quarterly basis as long as the well continues operate above the permitted operating temperature (55oC).

By adopting this procedure RLC will continue to operate the LFG collection system in a safe and effective manner, and provide better management of LFG generated by the landfill.

RLC will implement these procedures for the operation of LFG extraction wells during the month of December.

If you have any questions or comments regarding these procedures please contact me so that we may discuss them.

Sincerely,
Riverbend Landfill

George Duvendack
Operations Manager

CC: Dan Wilson (RLC)
RLC (Tech Files)
Permits Coordinator (ODEQ)
Gary L. Andes (ODEQ)
Monty M Morshed P.E. (ODEQ)
Roger North (WM)

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Western Region - Salem Office
750 Front St. NE, Ste. 120
Salem, OR 97301-1039
(503) 378-8240
(503) 378-3684 TTY

December 16, 2005

RECEIVED
20 2005
RIVERBEND LANDFILL COMPANY

George Duvendack
Riverbend LandfillCompany
13469 SW Highway 18
McMinnville, OR 97128

RE: Riverbend Landfill
TV Permit No. 36-0011
Yamhill County
Well Temperatures

Dear Mr. Duvendack:

On 12/15/00, you submitted a letter to the Department concerning Condition No. 11.9 of your Title V permit (now Condition No. 9.9 in the permit issued 10/3/05) and landfill gas extraction well temperatures. Although we agreed verbally with your letter at that time, no written documentation was done to approve what you had proposed.

Condition 9.9 requires that landfill gas extraction wells be operated to maintain an exhaust temperature of less than 55 degrees C. If this temperature is exceeded as noted in the monthly required monitoring, then corrective action must be taken to attempt to reduce the temperature below 55 degrees C. As you note in your letter, wells may exceed this temperature for a variety of reasons and it is sometimes not possible to adjust the gas flow to achieve this temperature while keeping other operating parameters within acceptable ranges.

In your letter you outlined procedures that Riverbend Landfill will utilize to maintain safe and effective operation of the landfill gas collection system and extraction wells while attempting to meet the temperature limit. These procedures are acceptable to the Department and should allow Riverbend Landfill to operate the gas collection system effectively while still providing monitoring information which verifies that no combustion of landfill materials is occurring where the elevated temperatures exist.

If you have any questions about this approval of your operating procedures, please do not hesitate to call me at 503/378-8240, ext. 234.

Sincerely,

Gary Andes

Gary Andes
Natural Resource Specialist

Riverbend Landfill Company
13469 SW Highway 18
McMinnville, OR 97128
(503) 472-8788
(503) 434-9770 Fax

September 19, 2019

Michael Eisele, PE
Oregon Department of Environmental Quality
Western Region – Salem Office
4026 Fairview Industrial Dr. SE
Salem, OR 97302

RE: Riverbend Landfill Co.
Title V Operating Permit No. 36-0011
Higher Operating Value (HOV) Pursuant to Title V Condition No. 9.9

Dear Mr. Eisele:

The Riverbend Landfill Co. (RLC) is subject to the New Source Performance Standards for Municipal Solid Waste Landfills (Landfill NSPS), 40 CFR 60.753(c) Subpart WWW. The Landfill NSPS and Condition No. 9.9 of the RLC Title V operating permit requires that landfill gas (LFG) extraction wells be operated to maintain a temperature <55 °C (equivalent to 131 °F).

Based on information collected during routine LFG monitoring, RLC has identified that RB16V316, RB19V366 and RVBDH047 are operating at a temperature above 55 °C. The reason these collectors tend to be warmer may be attributed, but not limited, to an accelerated biodegradation, climatic conditions (high moisture in waste), make-up of the waste in the affected zone of the well, and/or the age of the waste surrounding the collectors.

RLC proposed a procedure for operating landfill gas extraction wells at a higher operating value (HOV) in a letter to Oregon Department of Environmental Quality (DEQ) dated December 15, 2000. DEQ approved this procedure on December 16, 2005. RLC maintains an internal tracking system of LFG wells to which this procedure applies, and this letter serves as an update to DEQ.

RB16V316, RB19V366 and RVBDH047 will be assigned HOVs of 145 degrees Fahrenheit (°F) effective the date of this letter. This updated list of HOV wells is restated in Attachment A, with tables indicating both active and decommissioned HOV wells.

RLC will provide updates to the DEQ as wells are added in the future. If you have any questions regarding this submittal, please contact William Hickey at 503-331-2239 or whickey2@wm.com.

Sincerely,
Riverbend Landfill Co.

Nicholas Godfrey
Senior District Manager

ATTACHMENT A

RIVERBEND LANDFILL HOV WELLS

Current Active HOV Wells

Well ID	Date	HOV Threshold
RB16V316	**9/19/2019**	**≤145**
RB16V318	6/21/2018	≤145
RB18V354	7/16/2019	≤145
RB18V355	6/21/2018	≤145
RB18V356	6/26/2019	≤145
RB19V366	**9/19/2019**	**≤145**
RVBD097S	10/21/2010	≤145
RVBD103S	10/27/2010	≤145
RVBD159D	11/15/2011	≤145
RVBD162A	6/21/2018	≤145
RVBDH044	2/8/2019	≤145
RVBDH045	9/24/2015	≤145
RVBDH046	4/12/2013	≤145
RVBDH047	**9/19/2019**	**≤145**
RVBDH076	9/28/2015	≤160
RVBDV092	10/20/2015	≤145
RVBDV094	10/31/2008	≤145
RVBDV095	10/27/2010	≤145
RVBDV096	10/21/2010	≤150
RVBDV098	10/21/2010	≤150
RVBDV100	10/31/2008	≤145
RVBDV101	10/31/2008	≤145
RVBDV102	10/31/2008	≤155
RVBDV112	11/6/2008	≤145
RVBDV128	7/21/2009	≤145
RVBDV140	5/10/2012	≤145
RVBDV141	9/23/2010	≤145
RVBDV154	11/15/2011	≤145
RVBDV160	11/15/2011	≤155
RVBDV161	11/15/2011	≤155
RVBDV175	12/6/2012	≤145
RVBDV192	5/8/2015	≤150
RVBDV195	3/18/2015	≤145
RVBDV199	6/21/2018	≤145

*New wells added to the HOV list are shown in bold.

Decommissioned HOV Wells

Current ID	HOV Date	HOV Threshold	Decom Date
00000095	10/31/2008	≤145	6/26/2009
00000096	10/31/2008	≤145	6/2/2009
00000098	10/31/2008	≤145	6/2/2009
00000099	10/31/2008	≤145	4/10/2009
00000104	10/31/2008	≤145	4/16/2009
00000105	10/31/2008	≤140	5/12/2009
00000106	10/31/2008	≤145	5/12/2009

Decommissioned HOV Wells

Current ID	HOV Date	HOV Threshold	Decom Date
00000107	10/31/2008	≤145	5/12/2009
00000108	10/31/2008	≤145	5/12/2009
00000109	10/31/2008	≤155	6/2/2009
00000110	11/6/2008	≤150	4/15/2009
00000111	11/6/2008	≤150	5/27/2009
00000114	11/13/2008	≤145	4/15/2009
00000118	11/13/2008	≤145	12/18/2008
00000120	11/6/2008	≤145	12/18/2008
RVBD0132	7/21/2009	≤145	7/30/2009
RVBD134s	7/21/2009	≤145	6/24/2014
RVBD142S	9/23/2010	≤145	10/16/2014
RVBD159S	5/7/2012	≤145	2/22/2012
RVBD168S	7/19/2013	≤145	3/18/2015
RVBD169S	7/19/2013	≤145	10/14/2014
RVBDH039	8/10/2010	≤145	6/26/2017
RVBDH055	7/9/2012	≤145	9/29/2017
RVBDH056	7/9/2012	≤145	9/29/2017
RVBDV027	10/31/2008	≤145	9/29/2017
RVBDV070	10/31/2008	≤145	6/24/2014
RVBDV097	10/31/2008	≤145	7/22/2015
RVBDV103	3/22/2010	≤145	6/2/2009
RVBDV113	11/6/2008	≤145	8/28/2018
RVBDV115	11/13/2008	≤145	12/1/2013
RVBDV116	11/13/2008	≤145	2/28/2014
RVBDV117	11/13/2008	≤145	2/25/2009
RVBDV119	5/7/2012	≤145	5/12/2009
RVBDV122	8/14/2009	≤145	8/28/2018
RVBDV123	7/24/2009	≤145	2/28/2014
RVBDV129	7/21/2009	≤145	7/30/2009
RVBDV130	7/21/2009	≤145	12/2/2013
RVBDV135	3/5/2012	≤150	9/29/2017
RVBDV136	3/5/2012	≤150	9/29/2017
RVBDV157	2/21/2012	≤155	2/11/2012
RVBDV162	11/15/2011	≤145	12/1/2013
RVBDV164	11/15/2011	≤155	10/17/2014
RVBDV165	12/6/2012	≤145	10/17/2014
RVBDV166	11/15/2011	≤166	12/16/2014
RVBDV188	3/10/2015	≤160	8/10/2015
RVBDV210	3/18/2015	≤160	10/31/2016

APPENDIX D-2

LEACHATE COLLECTION SYSTEM HOV CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

NOV 0 7 2008

Ronald W. Gore, Chief
Air Division
Alabama Department of
Environmental Management
P.O. Box 301463
Montgomery, Alabama 36130-1463

Dear Mr. Gore:

The purpose of this letter is to provide you with a written determination regarding an applicability issue raised in the enclosed October 7, 2008, letter from Waste Management, Incorporated (WMI). This letter involves the Salem, Chastang, and Three Corner's Landfills located in Alabama, and all three of these sites are subject to 40 CFR Part 60, Subpart WWW - Standards of Performance for Municipal Solid Waste Landfills. In its letter regarding these landfills, WMI asked whether leachate collection risers must be connected to the nonmethane organic compound (NMOC) control system at each site. Based upon our review of Subpart WWW, we have determined that the decisions regarding whether leachate collection risers must be connected to the NMOC control system depend upon site-specific factors. The remainder of this letter provides details regarding the factors that should be considered when determining whether the leachate collection risers at a given landfill must be connected to the site's NMOC control system.

A leachate collection system is a network of interconnected drainage layers and piping that slope to low points where liquid is collected, and leachate collection risers provide pumping access to the sumps where liquids accumulate. According to WMI, risers are typically sealed with a blind flange, but they are sometimes connected to the NMOC control system to relieve landfill gas pressure and to control odors. The primary question posed by WMI is whether leachate collection risers must be connected to the NMOC control system or whether landfill owners and operators have the flexibility to decide when to connect risers to the control system.

Based upon our review of Subpart WWW, we have identified two scenarios under which connecting leachate collection risers to the NMOC control system would be required. These two scenarios are when a riser is not sealed to prevent uncontrolled landfill gas emissions to the atmosphere or when the landfill gas collection capacity of the leachate system must be utilized in order to meet the applicable landfill surface methane concentration limit in Subpart WWW. In circumstances where neither of these scenarios apply, decisions regarding whether to connect leachate collection risers to the NMOC control system would be at the discretion of the landfill owner/operator.

Our determination that leachate collection risers must be connected to the NMOC control system when they are not sealed is based upon the fact that leachate collection risers provide a pathway for landfill gas to bypass the NMOC control system if the riser has not been sealed to prevent landfill gas from escaping. Since allowing landfill gas to bypass the control system will reduce the effectiveness of the system significantly, leachate collection risers must be connected to the NMOC control system if they are not sealed with a blind flange or other closure device to prevent landfill gas from being vented directly to the atmosphere.

Our determination that leachate collection risers must be connected to the NMOC control system when the gas collection capacity of the leachate system is utilized in order to meet applicable methane surface concentration limits is based upon a requirement in Subpart WWW that the landfill surface methane concentration be maintained below 500 parts per million (ppm). This concentration limit is used to verify that the site's gas collection system is operating properly, and owners and operators are required to monitor the methane concentration at 30 meter intervals across the surface of the landfill on a quarterly basis in order determine compliance with 500 ppm limit. When an exceedance of the 500 ppm limit is identified, corrective action must be taken, and depending upon the cause and duration of the exceedance, the corrective action could include cover maintenance, adjusting the vacuum for existing gas collection wells, or installing new gas collection wells.

Based upon language in 40 CFR §60.752(b)(2)(i)(D), a variety of gas collection system designs can be used to satisfy the NMOC control requirements in Subpart WWW. Among the potentially acceptable collectors identified in this section of the rule are vertical wells, horizontal trenches, leachate collection components, and passive systems. Depending upon the gas collection capacity of the other components (i.e., vertical wells, vertical wells, and passive collectors) at a given landfill, it may be necessary to collect gas from the leachate system in order to meet the applicable 500 ppm methane surface concentration limit in Subpart WWW. When this is the case, connecting leachate risers to the NMOC control system would be mandatory, rather than optional.

Based upon the determination provided in this letter, it would not be necessary to connect leachate collection risers to the NMOC control system if the risers are sealed to prevent emissions to the atmosphere and 500 ppm methane surface concentration limit can be met without utilizing the landfill gas collection capacity of the leachate collection system. Consistent with previous U.S. Environmental Protection Agency (EPA) determinations, leachate collection risers are subject to Subpart WWW operational requirements involving temperature, pressure, and gas composition (nitrogen/oxygen content) when they are connected to NMOC control system. These operational requirements apply both to risers that must be connected to the NMOC system and to risers that are connected to the NMOC control system at the discretion of the landfill owner/operator.

The determination provided in this letter supersedes some of the guidance provided in a previous determination that Region 4 issued regarding the Pecan Grove Sanitary Landfill (PGSL) in Harrison County, Mississippi. That November 23, 2004, determination was in response to an earlier WMI request for clarification regarding the applicability of Subpart WWW to leachate collection risers. In our letter regarding the PGSL, we rejected a WMI argument that leachate collection risers should not be subject to the Subpart WWW operational requirements for interior wells when they are connected to the NMOC control system. In addition, we indicated that leachate collection components located within the outer boundary of the landfill must be connected to the NMOC control system.

With respect to the first issue addressed in our November 23, 2004, letter (whether leachate collection risers meet the definition of an interior well when they are connected to the NMOC control system), our position has not changed. With respect to the second issue addressed in our previous letter (whether leachate collection risers must be connected to the NMOC control), our position has changed somewhat. After further consideration, we have concluded that requiring that all leachate collection risers be connected to the NMOC control system is too restrictive because it does not allow site-specific factors (i.e., whether a riser is sealed to prevent emissions to the atmosphere or whether the riser's landfill gas collection capacity must be utilized in order to meet the 500 ppm methane surface concentration limit) to be considered when deciding whether a given riser must be connected to the NMOC control system. This position is consistent with the interpretation discussed above.

If you have any questions about the determination provided in this letter, please contact Mr. David McNeal of the EPA Region 4 staff at (404) 562-9102.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics
Management Division

Enclosure

cc: Larry Brown, ADEM
Craig Allen, ADEM
David G. Thorley, Waste Management

Oregon
John A. Kitzhaber, MD, Governor

Department of Environmental Quality
Western Region - Salem Office
750 Front Street NE, Suite 120
Salem, OR 97301
PH (503) 378-8240
FAX (503) 373-7944
OTRS 1-800-735-2900

July 27, 2012

William Carr, Sr. District Manager
Riverbend Landfill Co., Inc.
13469 SW Highway 18
McMinnville, OR 97128

RE: AQ-Riverbend Landfill
Title V Permit 36-0011
Yamhill County
Exemption from O_2 Levels

Dear Mr. Carr:

The Department has received and reviewed your letter of 7/18/12 regarding O_2 levels in leachate cleanout risers.

Riverbend Landfill is subject to the New Source Performance Standards for Municipal Solid Waste Landfills in 40 CFR Part 60 Subpart WWW. Those standards in 40 CFR 60.753(c) and Condition 9.9(2) of your Title V permit requires that all interior landfill gas extraction wells be operated to maintain either N_2<20% or O_2<5% at each wellhead. The Department does not believe that these standards were meant to apply to other areas of the active landfill gas collection system such as leachate cleanout risers, leachate collection pipes, or sumps. One of the main purposes of the NSPS standards was to prevent the potential for fires within the landfill waste and the Department believes that the potential for fire in the leachate collection systems is essentially nil.

Therefore, the Department is granting an exemption to the NSPS standards and Condition 9.9(2) for all leachate cleanout risers, leachate collection pipes, or sumps for the N_2 and O_2 levels (as well as the temperature requirements in 9.9(2)). We understand that Riverbend will continue to operate these leachate collection areas as odor control points.

If you have any questions about this approval, please do not hesitate to call me at 503/378-5316.

Sincerely,

Gary Andes
Natural Resource Specialist

Cc: Jeff O'Leary, Waste Management
Riverbend Landfill

APPENDIX D-3

EARLY MONITORING CLARIFICATION ADI

Search Applicability Determination Index

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Determination Detail

Control Number: 0800012

Category: NSPS
EPA Office: Region 4
Date: 05/31/2007
Title: Applicability of Well Monitoring Requirements
Recipient: Stephens, Barry R.
Author: Banister, Beverly H.
Comments:

Subparts: Part 60, WWW Municipal Solid Waste Landfills

References: 60.753(a)
60.753(b)
60.753(c)
60.755(a)
60.753
60.755
60.753(a)(2)

Abstract:

Q: Does EPA approve delaying implementation of the pressure, temperature, and oxygen monitoring requirements under 40 CFR part 60, subpart WWW until September 2010, for seven wells that are located in an active area that first received waste in September 2005, at the Chestnut Ridge Landfill in Heiskell, Tennessee?

A: EPA finds that the proposal to delay monitoring for these wells would be consistent with the intent of § 60.753 in NSPS subpart WWW provided that the area of the landfill where the wells are located is not closed or does not reach final grade prior to September 2010.

Letter:

Barry R. Stephens, P.E., Director
Division of Air Pollution Control
TN Dept. of Environment & Conservation
9th Floor, L&C Annex
401 Church Street

Nashville, TN 37243-1531

Dear Mr. Stephens:

This letter is in response to a letter in which Lacey J. Hardin of your staff requested a determination regarding an applicability issue that the Waste Management Company (WMC) raised regarding seven gas extraction wells at the Chestnut Ridge Landfill in Heiskell, Tennessee. This landfill is subject to 40 CFR Part 60, Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills), and WMC requested that the seven wells in question be exempt from monthly pressure, temperature, and oxygen monitoring requirements until September 2010. Based upon our review of Subpart WWW and the information submitted by WMC, we have determined that exempting the wells in question from pressure, temperature, and oxygen content monitoring would be consistent with the intent of Subpart WWW if this area of the landfill remains active until September 2010 or later. Details regarding the basis for this determination are provided in the remainder of this letter.

Under provisions in 40 CFR Sec. 60.753(a), owners and operators of landfills subject to Subpart WWW are required to operate a gas collection and control system (GCCS) where waste has been in place for five years or more in active areas or where waste has been in place for two years or more in closed areas or in areas that have reached final grade. A number of operating limits for well heads in the GCCS are specified in 40 CFR Sec. 60.753(b) and 40 CFR Sec. 60.753(c). These provisions require that well heads be operated under negative pressure, that well head temperatures be kept below 55 C, and that landfill gas nitrogen or oxygen levels be maintained within specified limits (less than 20 percent for nitrogen or less than 5 percent for oxygen). Under provisions in 40 CFR Sec. 60.755(a), owners and operators of GCCS subject to these operational limits are required to monitor well head pressure, temperature, and gas composition on a monthly basis. When deviations from any of the operating limits in the rule are noted, owners and operators must take corrective action to bring the collection system back into compliance.

According to the letter in which WMC requested a monitoring waiver, the seven wells in question are located in an active area of the Chestnut Ridge Landfill where waste was first placed in September 2005. Based upon the date when this area was first used for waste disposal, the company would not be required to operate gas extraction wells until September 2010. Since the wells in this area were installed prior to the applicable operating deadline in Subpart WWW, WMC asked that they be exempt from temperature, pressure, and oxygen monitoring until September 2010 if the area remains active or until two years after final grade is reached in the area where the wells are located.

Based upon our review of Subpart WWW, the operational requirements in 40 CFR Sec. 60.753 and the associated monitoring requirements in 40 CFR Sec. 60.755 are applicable in areas where a GCCS must be installed and operated under provisions in 40 CFR Sec. 60.753(a). Since the seven wells covered by WMC's request for a monitoring exemption are located in an active area that first received waste in September 2005, they are in an area where a GCCS would not be required under the provisions in 40 CFR Sec. 60.753(a). Because WMC is not currently required to operate a GCCS in this area of the landfill, the pressure, temperature, and oxygen limits in 40 CFR Sec. 60.753 would not apply to the seven well heads covered by the company's request for a monitoring waiver. Therefore WMC's proposal to delay pressure, temperature, and oxygen monitoring for these seven wells until September 2010 would be consistent with the intent of Subpart WWW if this area of the landfill remains active until September 2010 or later.

If any portion of the landfill covered by WMC's waiver request reaches final grade between September 2007 (i.e., two years after the area was first used for waste disposal) and September 2010, the requirement to operate a GCCS would apply at the time final grade is reached. This determination is based upon the provisions in 40 CFR Sec. 60.753(a)(2) that require operation of a GCCS where waste has been in place for two years or more in closed areas or areas at final grade. Therefore, WMC's request that the monitoring waiver for the seven wells in question be extended for two years if final grade is reached prior to September 2010 would not be consistent with the intent of Subpart WWW. If this area of the landfill reaches final grade prior to September 2007, the requirement to have a GCCS and implement the associated monitoring provisions would apply beginning in September 2007. If this area of the landfill reaches final grade after September 2007, but prior to September 2010, the requirement to have a GCCS and implement the associated monitoring would apply at the time final grade is reached.

If you have any questions about the issues addressed in this letter, please contact Mr. David McNeal of the U.S. Environmental Protection Agency Region 4 staff at (404) 562-9102.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics
Management Division

cc: Lacey J. Hardin
Division of Air Pollution Control
TN Dept. of Environment & Conservation
9th Floor, L&C Annex
401 Church Street
Nashville, TN 37243-1531

APPENDIX E

TREATMENT SYSTEM MONITORING PLAN

MONITORING PLAN

TITLE 40: PART 60: SUBPART XXX
TITLE 40: Part 63: Subpart AAAA

Landfill Gas Treatment System

LANDFILL GAS TO ENERGY PLANT

Title V Operating Permit Number 36-0011

RIVERBEND LANDFILL CO.

Riverbend Landfill

13469 SW Highway 18

Mcminnville, OR 97128

WASTE MANAGEMENT

LANDFILL GAS TREATMENT SYSTEM MONITORING PLAN

Facility: Riverbend Landfill

Location: Engine Plant

Regulation References: 40 CFR 60 Subpart XXX, 40 CRF 63 Subpart AAAA

This Landfill Gas Treatment System Monitoring Plan has been prepared pursuant to 40 CFR 60.767(c) and 60.768(b)(5) of Subpart XXX and 40 CFR 63.1983(b)(5) of Subpart AAAA. The landfill gas treatment system consists of equipment required to treat landfill gas prior subsequent sale or beneficial use. Landfill gas treatment system includes filtration, compression, and moisture removal. As such, the purpose of this plan is to outline monitoring and data collection practices to ensure the treatment system is operating as designed to filter, compress, and remove moisture. Site will perform routine parametric monitoring to ensure proper operation. Continuous monitoring of the parameters below is not required for proper operation of the treatment system.

Description of each key component of a treatment system:

- **Filtration** - Landfill gas passes through two filtering steps in the treatment system. An in-line demister mesh pad, installed prior to the compressor, is designed to protect equipment, by removing larger pieces of debris from the gas stream. Secondary coalescing filters are placed in-line, after the gas cooler, to provide additional filtration at the back end of the system, prior to re-heating and delivery. The monitoring method, frequency and operating range in Table 1 ensure that the treatment system is properly removing particulate matter as needed to meet the definition of treatment system and for the intended beneficial use.

- **Compression** - Landfill gas is extracted from the landfill under vacuum. The compression step is required to ensure gas is delivered at the needed pressure to be used as a fuel. The compression process increases the pressure and temperature of the gas. The monitoring method, frequency and operating range in Table 1 ensure compression of the landfill gas is occurring as needed to meet the definition of treatment system and for the intended beneficial use.

- **Moisture removal -** The gas is processed through a gas cooler to lower the temperature which removes moisture. As the gas is cooled, entrained moisture is condensed and trapped by the in-line coalescing filters, removed from the process and managed in the condensate removal system. The monitoring method, frequency and operating range in Table 1 ensure proper moisture removal is occurring to for the intended beneficial use of the treated landfill gas and meets the definition of treatment system.

Table 1 - Landfill Gas Treatment System Monitoring Plan				
Equipment	**Parameter**	**Inspection Frequency**	**Monitoring Device**	**Range of Operation**
Compressor/Blower Discharge Pressure	Discharge Pressure	Twice per Month	Pressure Monitoring Device	1-14 psi
Coalescing Filter Vessel/Final Gas Filter	Differential Pressure	Twice per month	Pressure Monitoring Device	0.1 – 4.0 psi / 2 to 100 inches WC (differential pressure between the inlet and outlet of the filter vessel)
Gas Cooler (moisture removal)	Differential temperature	Twice per month	Temperature gauges	Differential temperature of at least 10ºF

Responsibility for Data Collection
The following job titles that are authorized to take these readings: Gas Plant Manager, Regional Manager, Landfill Gas Technician/Consultant, or Operations Specialist.

Recordkeeping
The person(s) performing the inspection as per the frequency listed in Table 1, will record the observed value and determine if the value is within the range of operation. If the recorded value is out of the range of operation, they will immediately take corrective action, including contacting all relevant staff, as necessary. Furthermore, collected data and a description of the actions taken will be placed into the plant file.

Quality Assurance/Maintenance/Repair
The data and equipment are reviewed regularly during the month to verify accuracy and look for trends that may be characteristic of diminishing performance. Additionally, staff perform visual inspections of the equipment and note issues as they arise. Repairs will be made as necessary. At a minimum, filters will be cleaned and or replaced as needed to maintain the listed differential pressures.

ATTACHMENT

Example Form

Landfill Gas Treatment System Monitoring Data Sheet

Waste Management Renewable Energy
Riverbend Landfill
Engine Plant
40 CFR 60, Subpart XXX, 40 CFR 63, Subpart AAAA: Landfill Gas Treatment System Monitoring Data Sheet

Name: ______________________ Title:______________________

	Date	Compressor/Blower Discharge Pressure (1-14 psi)	Within Spec (circle one)	Coalescing Filter Vessel Differential Pressure (0.0-4.0 psi / 2-100 In. WC)	Within Spec (circle one)	Gas Cooler Differential Temperature (> 10F)	Within Spec (circle one)	Corrective Action if out of Specification
January			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
February			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
March			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
April			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
May			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
June			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
July			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
August			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
September			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
October			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
November			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	
December			Yes / No		Yes / No		Yes / No	
			Yes / No		Yes / No		Yes / No	

APPENDIX F

INITIAL PERFORMANCE TEST

HORIZON ENGINEERING
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

Project No. 4203

Permit No. 36-0011-TV-01

SOURCE EVALUATION REPORT

Riverbend Landfill Company, Inc. McMinnville, Oregon

Landfill Flare Inlet and Outlet

Particulate Matter, Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, Volatile Organic Compounds as Total Gaseous Organic Compounds, Total Reduced Sulfur as Hydrogen Sulfide, and Opacity

April 12-14, 2011

Test Site:
Riverbend Landfill Company, Inc.
13469 South West Highway 18
McMinnville, Oregon 97128

TABLE OF CONTENTS

	Page Number
1. CERTIFICATION	
1.1 Test Team Leader	5
1.2 Report Review	5
1.3 Report Review	5
2. INTRODUCTION	
2.1 Test Site	6
2.2 Mailing Address	6
2.3 Test Log	6
2.4 Test Purpose	7
2.5 Background Information	7
2.6 Participants	8
3. SUMMARY OF RESULTS	9
3.1 Table(s) of Results:	
Table 1 - Summary of Averaged Test Results	10
Table 2 - FLRN A PM/Opacity	12
Table 3 - FLRN A Gaseous Emissions Results	14
Table 4 - FLRN B PM and Opacity	15
Table 5 - FLRN B Gaseous Emissions	17
Table 6 – Comb. FLRN A & B PM and Opacity	18
Table 7 – Comb. FLRN A & B Gaseous Emissions	19
Table 8 - Flare Inlet - Gas Composition & Flow Rate	20
3.2 Description of Collected Samples	20
3.3 Discussion of Errors and Quality Assurance Procedures	21
4. SOURCE DESCRIPTION AND OPERATION	
4.1 Process and Control Device Description and Operation:	23
4.2 Test Ports	23
4.3 Process & Control Equipment Flow Diagram	25
4.4 Operating Parameters	25
4.5 Process Startups/Shutdowns During Tests	25
4.6 On-Site Photograph:	
5. SAMPLING AND ANALYTICAL PROCEDURES	
5.1 Sampling Procedures	27
5.2 Sampling Train Diagrams	36
5.3 Horizon Test Equipment:	38

	Page Number
6. DISCUSSION	39

Figure 1: Sampling at Flare Outlet
Figure 2: Flare Outlet Ports
Figure 3: ODEQ Method 5 Particulate Matter Sample Train Diagram
Figure 4: EPA Methods 3A, 6C, 7E, & 10 Analyzer Sample System Diagram
Figure 5: EPA Method 25A VOC Analyzer Sample System Diagram

APPENDIX	Page Number
Abbreviations & Acronyms	40
Nomenclature & Drift Correction Documentation	42
LFG Flare Outlet (FLRN A & FLRN B)	
PM	
Results and Example Calculations	44
Field Data	79
Sample Recovery Field Data & Worksheets	87
Blank Corrections	93
Laboratory Results, Worksheets, Tares and COC	96
Traverse Point Locations	137
Cyclonic Flow Measurement	140
Visual Determination of Opacity	
Field Data	142
Certifications	146
Gases (CO, NO_x, SO_2, TGOC)	
Results and Example Calculations	148
O_2 & CO_2 for Molecular Weight Determinations	167
Analyzer Calibration Field Data and QA Checks	172
Data Logger Gas Charts & Printouts	178
LFG Flare Inlet	
TRS as H_2S	
Results and Example Calculations	205
Laboratory Results and COC	210

APPENDIX (Continued)	**Page Number**
Flow Rate and Gas Composition	
Results and Example Calculations	234
Field Data	238
Laboratory Results and COC (See H_2S Above)	210
Gas Composition Worksheet	240
Traverse Point Locations	241
EPA Method 19 Combustion Calculations	245
Process/Sampling Equipment Flow Diagram	253
Production/Process Data	254
Calibration Information	
Meter Box	260
Calibration Critical Orifices	262
Standard Meter	263
Pitots	264
Shortridge Micromanometer	266
Magnehelic Gauges	267
Thermocouples and Indicators	268
Nozzle Diameters (See Field Data Sheets)	--
Barometer	279
Calibration Gas Certificates	280
QA/QC Documentation	
Procedures	289
NO_x Analyzer Converter Efficiency Data	292
Analyzer Interference Response Data	293
Correspondence	
Source Test Plan	298
ODEQ Source Test Plan Response	309
Test Plan Revisions and Correspondence with ODEQ	317
Permit (Selected Pages)	323
Personnel Qualifications	334

1. CERTIFICATION

1.1 Test Team Leader

I hereby certify that the test detailed in this report, to the best of my knowledge, was accomplished in conformance with applicable rules and good practices. The results submitted herein are accurate and true to the best of my knowledge.

Name: Joseph M. Heffernan III, QSTI

Signature ____________________ Date 6/7/11

1.2 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: David Bagwell, QSTI

Signature ____________________ Date 6/3/11

1.3 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: Michael E. Wallace, PE

Signature ____________________ Date 6/7/11

2. INTRODUCTION

2.1 Test Site: Riverbend Landfill Company, Inc.
13469 South West Highway 18
McMinnville, Oregon 97128

2.2 Mailing Address: Same as above

2.3 Test Log:

Flare Outlet, FLRN A: PM, CO, NO_x, SO_2, TGOC, and Opacity

Test Date	Run No.	Test Time
PM and Opacity		
April 12, 2011	1	15:20 – 18:22
April 12, 2011	2	19:36 – 22:08
April 12-13, 2011	3	22:50 – 01:11
April 14, 2011	4	08:33 – 10:48
April 14, 2011	5	11:21 – 13:37
CO, NO_x, SO_2 and TGOC		
April 12, 2011	1	15:20 – 18:49
April 12, 2011	2	19:36 – 21:07
April 12-13, 2011	3	22:57 – 01:10
April 14, 2011	4	08:40 – 10:00
April 14, 2011	5	11:21 – 12:41

Summary: Three valid runs were obtained for PM (Runs 1, 3, and 4); Run 2 did not pass the post-test leak check; the probe for Run 5 contacted the flare wall insulation, potentially contaminating the sample. See more explanation of PM runs in Sections 5.1.3 and 5.1.4. Three valid runs were obtained for opacity; five valid runs were obtained for CO, NO_x, SO_2, and TGOC.

Flare Outlet, FLRN B: PM, CO, NO_x, SO_2, TGOC, and Opacity

Test Date	**Run No.**	**Test Time**
PM and Opacity		
April 13, 2011	1	09:52 – 12:29
April 13, 2011	2	13:30 – 15:52
April 13, 2011	3	16:32 – 18:50
CO, NO_x, SO_2 and TGOC		
April 13, 2011	1	09:59 – 11:44
April 13, 2011	2	13:35 – 15:10
April 13, 2011	3	16:31 – 18:44

Summary: Three valid runs were obtained for all pollutants and opacity.

Flare Inlet: TRS as H_2S, Gas Composition

Test Date	**Run No.**	**Test Time**
April 12, 2011	1	Time Not Recorded (Run 1)
April 13, 2011	2	12:43 (Run 1)
April 14, 2011	3	14:06 (Run 2)

Summary: Three valid samples were obtained for sulfur analysis and gas composition.

2.4 Test Purpose: The purpose of the test was initial compliance with Title V Permit No. 36-0011-TV-01 issued March 5, 2010 by Oregon Department of Environmental Quality (ODEQ). The source was originally tested on September 30, 2010 but operational issues interfered with the proper operation of the device as well as the validity of the results.

The test was also to establish and/or verify emission factors of measured pollutants in lb/MMscf of landfill gas combusted.

2.5 Background Information: None

2.6 Participants:

Horizon Personnel:

Joseph Heffernan III, QSTI, Team Leader, Calculations, and Report Review

Matt Busch, Thomas Lyons, Field Technicians

Michael E. Wallace, PE, Calculations and QA/QC

David Bagwell, QSTI, Report Review

Kate Krisor, Technical Writer

Test Arranged by: George Duvendack and Dave Wilson, Riverbend Landfill Company

Source Operator: Mike Parker, Riverbend Landfill Company

Observers:

Plant Personnel: George Duvendack and Dave Wilson

Consultant: Leslie Johnson, SCEC

Agency Personnel: Michael Eisele, ODEQ

Test Plan Sent to: Raimond Peterson and Michael Eisele, ODEQ

3. SUMMARY OF RESULTS

A comparison of average test results and permit limits or emissions factors is in Table 1. As shown in the table, results for all pollutants except SO_2 (as measured by continuous instrumental method and as calculated from TRS analysis of inlet landfill gas samples) were well below the permit limits and emission factors.

FLRN A and FLRN B are summarized in separate tables for PM and gaseous emissions. PM was calculated three ways: using ODEQ Method 5 results, dehydrated results, and combined ODEQ5-dehydrated results minus sulfates. An explanation of these three different calculations is in Section 5.1.4.

The gaseous emissions include CO, NO_x, SO_2, and TGOC, as well as inlet TRS as H_2S results converted to outlet SO_2. TGOC results were calculated on a propane and hexane basis, as directed by Raimond Peterson of ODEQ.

One set of emission rate results is calculated using EPA Method 19 calculated flow rates, and a second set using EPA Method 2 measured flow rates. As discussed in Section 5.1.4, the EPA Method 19 results are presented in the tables, and the EPA Method 2 results are presented in the Appendix. This section also contains a discussion of the differences between these two sets of results.

Results for FLRN A are in Tables 2 and 3; FLRN B results are in Tables 4 and 5; combined FLRN A and FLRN B results are in Tables 6 and 7. Flare inlet gas composition results are in Table 8.

All of the results for emission factor verification, in lb/MMscf LFG, were calculated using the landfill gas flow rates recorded by Riverbend Landfill during testing. Results are also calculated and presented in the tables in units of lb/MMBtu for Riverbend Landfill vendor guarantees.

3.1 Tables of Results: (See Following Pages)

Table 1
Riverbend Landfill Flare Outlet - Summary of Averaged Test Results for Comparison with Permit Limits and Emission Factors
Test Dates: April 12-14, 2011

	Units	Results Using EPA M19 Flow	Permit Limit or EF
Landfill Flare Outlet FLRN A [1]			**Permit Limit**
Total PM ODEQ5	gr/dscf	--	0.1
Total PM Dehydrated	gr/dscf	--	0.1
Total PM Less Sulfate	gr/dscf	--	0.1
TGOC	ppmv- C_6H_{14} @3% O_2	--	20
Opacity	%	--	20
			Emission Factor
Total PM ODEQ5	lb/MMscf of LFG [2]	12.5	19.1
Total PM Dehydrated	lb/MMscf of LFG	7.2	19.1
Total PM Less Sulfate	lb/MMscf of LFG	1.5	19.1
CO	lb/MMscf of LFG	21.5	27.8
NO_x	lb/MMscf of LFG	27.6	53.6
SO_2	lb/MMscf of LFG	54.8	35.5
TRS as H_2S (SO_2) [3]	lb-SO_2/MMscf of LFG	74.8	35.5
TGOC	lb- C_6H_{14}/MMscf of LFG	6.5	18.49
Landfill Flare Outlet FLRN B			
Total PM ODEQ5	gr/dscf	--	0.1
Total PM Dehydrated	gr/dscf	--	0.1
Total PM Less Sulfate	gr/dscf	--	0.1
TGOC	ppmv- C_6H_{14} @3% O_2	--	20
Opacity	%	--	20
			Emission Factor
Total PM ODEQ5	lb/MMscf of LFG	9.5	19.1
Total PM Dehydrated	lb/MMscf of LFG	6.5	19.1
Total PM Less Sulfate	lb/MMscf of LFG	3.1	19.1
CO	lb/MMscf of LFG	19.7	27.8
NO_x	lb/MMscf of LFG	34.7	53.6
SO_2	lb/MMscf of LFG	57.9	35.5
TRS as H_2S (SO_2)	lb-SO_2/MMscf of LFG	50.7	35.5
TGOC	lb- C_6H_{14}/MMscf of LFG	2.3	18.49

[1] Flare A PM averages were from Runs 1, 3, and 4; gaseous emissions averages were from Runs 1 through 5.
[2] Results in lb/MMscf were calculated using landfill gas flow data provided by Riverbend Landfill; the average of the minimum and maximum data were used.
[3] One inlet gas sample was collected per day for TRS as H_2S converted to SO_2 results.

Table 1 (Continued)

Riverbend Landfill Flare Outlet - Summary of Averaged Test Results for Comparison with Permit Limits and Emission Factors
Test Dates: April 12-14, 2011

	Units	Results Using EPA M19 Flow	Permit Limit or EF
Landfill Flare Outlet FLRN A & B [4]			
Total PM ODEQ5	gr/dscf	--	0.1
Total PM Dehydrated	gr/dscf	--	0.1
Total PM Less Sulfate	gr/dscf	--	0.1
TGOC	ppmv- C_6H_{14} @3% O_2	--	20
Opacity	%	--	20
			Emission Factor
Total PM ODEQ5	lb/MMscf of LFG	9.8	19.1
Total PM Dehydrated	lb/MMscf of LFG	6.6	19.1
Total PM Less Sulfate	lb/MMscf of LFG	2.9	19.1
CO	lb/MMscf of LFG	19.9	27.8
NO_x	lb/MMscf of LFG	33.8	53.6
SO_2	lb/MMscf of LFG	57.5	35.5
TRS as H_2S (SO_2)	lb-SO_2/MMscf of LFG	54.5	35.5
TGOC	lb-hexane//MMscf of LFG	2.8	18.49

[4] Flare A and Flare B combined concentrations (gr/dscf and lb/MMscf) were calculated using flow weighted averages; combined rates (lb/hr and lb/yr) were calculated using the sum of individual emission rates for FLRN A and FLRN B.

Table 2
Riverbend Landfill Flare Outlet FLRN A – PM and Opacity Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 12 & 14, 2011	**Units**	**Run 1** [5]	**Run 3**	**Run 4**	**Average**
Test Date		April 12	April 12	April 14	
Start Time		15:20	22:50	08:33	
End Time		18:22	01:11	10:48	
Sampling Time	minutes	126	126	126	126
Sampling Results					
PM (Less Sulfates) [6]					
Filterable PM Concentration	gr/dscf	0.00045	0.00037	0.00041	0.00041
Rate	lb/hr	0.028	0.022	0.018	0.023
Production-Based Rates	lb/MMscf	0.84	0.65	0.64	0.71
	lb/yr [7]	246	190	158	198
Condensable PM Concentration	gr/dscf	0.00056	0.00016	0.00061	0.0044
Rate	lb/hr	0.035	0.0092	0.027	0.024
Production-Based Rates	lb/MMscf	1.0	0.27	0.97	0.76
	lb/yr	305	81	238	208
Total PM Concentration	gr/dscf	0.0010	0.00053	0.0010	0.00085
Rate	lb/hr	0.063	0.031	0.045	0.046
Production-Based Rates	lb/MMscf	1.9	0.92	1.6	1.5
	lb/yr	552	271	396	406
Sample Weight, Filterable	mg	3	3	3	3
Sample Weight, Condensable	mg	4	1	4	3
Sample Weight, Total	mg	7	4	7	6
PM (Dehydrated) [8]					
Filterable PM Concentration	gr/dscf	0.00045	0.00037	0.00041	0.00041
Rate	lb/hr	0.028	0.022	0.018	0.023
Production-Based Rates	lb/MMscf	0.84	0.65	0.64	0.71
	lb/yr	246	190	158	198
Condensable PM Concentration	gr/dscf	0.0045	0.0035	0.0031	0.0037
Rate	lb/hr	0.28	0.21	0.14	0.21
Production-Based Rates	lb/MMscf	8.4	6.2	5.0	6.5
	lb/yr	2,458	1,811	1,219	1,829
Total PM Concentration	gr/dscf	0.0049	0.0039	0.0035	0.0041
Rate	lb/hr	0.31	0.23	0.16	0.23
Production-Based Rates	lb/MMscf	9.2	6.8	5.6	7.2
	lb/yr	2,704	2,001	1,377	2,028
Sample Weight, Filterable	mg	3	3	3	3
Sample Weight, Condensable	mg	31	26	20	26
Sample Weight, Total	mg	35	29	23	29

[5] The filter support melted during Run 1; however the results are consistent with Runs 3 and 4 and are reported in this table.
[6] To subtract sulfate artifacts, condensable PM sample was analyzed by IC for sulfate SO_4 after dehydration of ODEQ M5. The Method 202 purge after sampling was not done, so SO_2 in sample was already converted to H_2SO_4.
[7] Results in lb/year were calculated assuming the Flare is operating 24 hours per day, seven days per week (8760 hours).
[8] Dehydrated results include the back half sample dried after H_2SO_4 removed at Enthalpy by an ammonium procedure in EPA Method 202.

Table 2 (Continued)
Riverbend Landfill Flare Outlet FLRN A – PM and Opacity Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 12 & 14, 2011	**Units**	**Run 1**	**Run 3**	**Run 4**	**Average**
PM (ODEQ 5) [9]					
Filterable PM Concentration	gr/dscf	0.00045	0.00037	0.00041	0.00041
Rate	lb/hr	0.028	0.022	0.018	0.023
Production-Based Rates	lb/MMscf	0.84	0.65	0.64	0.71
	lb/yr	246	190	158	198
Condensable PM Concentration	gr/dscf	0.0080	0.0065	0.0058	0.0068
Rate	lb/hr	0.50	0.38	0.26	0.38
Production-Based Rates	lb/MMscf	14.9	11.4	9.2	11.8
	lb/yr	4,358	3,342	2,252	3,317
Total PM Concentration	gr/dscf	0.0084	0.0069	0.0062	0.0072
Rate	lb/hr	0.53	0.40	0.28	0.40
Production-Based Rates	lb/MMscf	15.7	12.0	9.8	12.5
	lb/yr	4,604	3,532	2,411	3,516
Sample Weight, Filterable	mg	3	3	3	3
Sample Weight, Condensable	mg	56	48	37	47
Sample Weight, Total	mg	59	51	40	50
Sample Volume	dscf	107.8	114.9	99.4	107.4
Percent Isokinetic	%	100	100	100	100
Opacity	%	0	0	--	0
O_2	%	13.0	12.5	12.2	12.6
CO_2	%	6.8	7.3	7.6	7.3
Flow Rate, EPA M 19, (Standard)	dscf/min	7,290	6,840	5,180	6,440
EPA M19 Calculated F-Factor 10	dscf/MMBtu	9,415.7	9,415.7	9,467.6	9,433.0
Temperature	°F	1,453	1,563	1,513	1,510
Moisture	%	7.8	8.0	7.5	7.8
Process/Production Data					
LFG inlet flow, min. (Riverbend data) [11]	scf/min	544.8	545.5	454.5	514.6
LFG inlet flow, max (Riverbend data)	scf/min	552.1	552.2	465.3	523.2
LFG inlet flow (Calc. Avg, EPA std) [12]	scf/min	558.1	558.5	468.0 [13]	528.2
Combustion Chamber Temp., Avg.	°F	1,521	1,522	1,522	1,522

[9] PM calculated using procedures in ODEQ5 and includes the particulate artifacts formed during testing (sulfates) in the back half of the sample train,

[10] F-Factor calculated from inlet gas composition and EPA Method 19 combustion calculations.

[11] Landfill gas flow as reported by Riverbend, using 14.7 psi and 59 °F.

[12] Calculated average landfill gas flow using EPA standard units of 14.7 psi and 68 °F.

[13] Run 4 landfill gas flow was inconsistent between the first and second half of the run; the average flow was used for calculations of lb/MMscf and in EPA M19 flow rates

Table 3
Riverbend Landfill Flare Outlet FLRN A – Gaseous Emissions Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 12 -14, 2011	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Run 5**	**Average**
Test Date		April 12	April 12	April 12-13	April 14	April 14	
Start Time		15:20	19:36	22:57	08:40	11:21	
End Time		18:50	21:07	00:10	10:00	12:41	
Sampling Results							
CO Concentration	ppmv	25	28	29	21	16	24
Rate	lb/hr	0.78	0.96	0.87	0.48	0.43	0.70
Production-Based Rates	lb/MMscf	23.3	28.6	25.8	17.0	12.8	21.5
	lb/yr	6,824	8,423	7,577	4,178	3,761	6,153
Fuel-Based Rates	lb/MMBtu	0.044	0.055	0.049	0.035	0.026	0.042
NO_x Concentration	ppmv	19	16	20	19	19	19
Rate	lb/hr	0.99	0.93	0.98	0.72	0.87	0.90
Production-Based Rates	lb/MMscf	29.6	27.7	29.3	25.7	26.0	27.6
	lb/yr	8,666	8,132	8,606	6,310	7,639	7,871
Fuel-Based Rates	lb/MMBtu	0.056	0.053	0.056	0.053	0.054	0.054
SO_2 Concentration	ppmv	30	24	26	27	26	27
Rate	lb/hr	2.2	1.9	1.8	1.4	1.7	1.8
Production-Based Rates	lb/MMscf	65.0	57.0	52.4	50.1	49.7	54.8
	lb/yr	19,057	16,756	15,386	12,322	14,572	15,619
Fuel-Based Rates	lb/MMBtu	0.12	0.11	0.10	0.10	0.10	0.11
TRS as H_2S Converted To SO_2	ppmv	450	450	450	450	450	450
Rate	lb/hr	2.5	2.5	2.5	2.1	2.5	2.4
Production-Based Rates	lb/MMscf	74.8	74.8	74.8	74.8	74.8	74.8
	lb/yr	21,945	22,001	21,961	18,404	21,945	20,770
Fuel-Based Rates	lb/MMBtu	0.15	0.15	0.15	0.14	0.16	0.15
TGOC Concentration	ppmv-C_3H_8	7.0	3.6	9.6	2.5	0.3	4.6
Conc. Corr. to 3% O_2	ppmv-C_6	0.2	0.1	0.2	3.3	0.4	0.8
Rate	lb-C_6/hr	0.34	0.19	0.44	0.087	0.013	0.22
Production-Based Rates	lb-C_6/MMscf	10.2	5.8	13.2	3.1	0.39	6.53
	lb-C_6/year	3,000	1,696	3,864	766	115	1,888
Fuel-Based Rates	lb/MMBtu	0.020	0.011	0.025	0.0064	0.0008	0.013
O_2	%	13.0	13.7	12.5	12.2	12.4	13.0
CO_2	%	6.8	6.3	7.3	7.6	7.5	7.2
Flow Rate EPA M 19, (Std)	dscf/min	7,290	7,980	6,840	5,180	6,330	6,720
Temperature	°F	1,453	1,507	1,563	1,513	1,536	1,510
Moisture	%	7.8	6.2	8.0	7.5	8.1	8.0
EPA M19 Calculated F-Factor	dscf/MMBtu	9,415.7	9,415.7	9,415.7	9,467.6	9,467.6	9,436.5

Table 4
Riverbend Landfill Flare Outlet FLRN B – PM and Opacity Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 13, 2011	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		09:52	13:30	16:32	
End Time		12:29	15:52	18:50	
Sampling Time	minutes	120	120	120	120
Sampling Results					
PM (Less Sulfates)					
Filterable PM Concentration	gr/dscf	0.00078	0.00026	0.00093	0.00065
Rate	lb/hr	0.32	0.10	0.32	0.25
Production-Based Rates	lb/MMscf	1.9	0.59	1.9	1.5
	lb/yr	2,829	897	2,837	2,188
Condensable PM Concentration	gr/dscf	0.00074	0.00043	0.0010	0.00072
Rate	lb/hr	0.31	0.17	0.35	0.28
Production-Based Rates	lb/MMscf	1.8	1.0	2.0	1.6
	lb/yr	2,689	1,495	3,050	2,411
Total PM Concentration	gr/dscf	0.0015	0.00068	0.0019	0.0014
Rate	lb/hr	0.63	0.27	0.67	0.53
Production-Based Rates	lb/MMscf	3.7	1.6	3.9	3.1
	lb/yr	5,518	2,392	5,888	4,599
Sample Weight, Filterable	mg	4	2	5	4
Sample Weight, Condensable	mg	4	3	6	4
Sample Weight, Total	mg	8	4	11	8
PM (Dehydrated)					
Filterable PM Concentration	gr/dscf	0.00078	0.00026	0.00093	0.00065
Rate	lb/hr	0.32	0.10	0.32	0.25
Production-Based Rates	lb/MMscf	1.9	0.59	1.9	1.5
	lb/yr	2,829	897	2,837	2,188
Condensable PM Concentration	gr/dscf	0.0020	0.0022	0.0024	0.0022
Rate	lb/hr	0.84	0.90	0.85	0.86
Production-Based Rates	lb/MMscf	4.9	5.2	4.9	5.0
	lb/yr	7,353	7,906	7,423	7,561
Total PM Concentration	gr/dscf	0.0028	0.0025	0.0034	0.0029
Rate	lb/hr	1.2	1.0	1.2	1.1
Production-Based Rates	lb/MMscf	6.8	5.8	6.8	6.5
	lb/yr	10,182	8,803	10,261	9,749
Sample Weight, Filterable	mg	4	2	5	4
Sample Weight, Condensable	mg	11	13	14	13
Sample Weight, Total	mg	15	15	19	16

Table 4 (Continued)

Riverbend Landfill Flare Outlet FLRN B – PM and Opacity Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 13, 2011	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
PM (ODEQ 5)					
Filterable PM Concentration	gr/dscf	0.00078	0.00026	0.00093	0.00065
Rate	lb/hr	0.32	0.10	0.32	0.25
Production-Based Rates	lb/MMscf	1.9	0.59	1.9	1.5
	lb/yr	2,829	897	2,837	2,188
Condensable PM Concentration	gr/dscf	0.0033	0.0037	0.0038	0.0036
Rate	lb/hr	1.4	1.5	1.3	1.4
Production-Based Rates	lb/MMscf	7.9	8.6	7.6	8.0
	lb/yr	11,831	12,905	11,488	12,075
Total PM Concentration	gr/dscf	0.0040	0.0039	0.0047	0.0042
Rate	lb/hr	1.7	1.6	1.6	1.6
Production-Based Rates	lb/MMscf	9.7	9.2	9.5	9.5
	lb/yr	14,660	13,802	14,325	14,263
Sample Weight, Filterable	mg	4	2	5	4
Sample Weight, Condensable	mg	17	22	22	20
Sample Weight, Total	mg	22	23	27	24
Sample Volume	dscf	82.4	90.7	89.3	87.5
Percent Isokinetic	%	101	100	99	100
Opacity	%	0	0	0	0
O_2	%	14.8	14.6	13.7	14.4
CO_2	%	5.5	5.5	6.4	5.8
Flow Rate, EPA M 19, (Standard)	dscf/min	48,400	46,800	40,700	45,300
EPA M19 Calculated F-Factor	dscf/MMBtu	9,412.1	9,412.1	9,412.1	9,412.1
Temperature	°F	1,399	1,444	1,435	1,426
Moisture	%	6.3	6.5	6.9	6.6
Process/Production Data					
LFG inlet flow, min. (Riverbend data)	scf/min	2,810	2,810	2,810	2,810
LFG inlet flow, max (Riverbend data)	scf/min	2,830	2,830	2,830	2,830
LFG inlet flow (Calc. Avg, EPA std)	scf/min	2,869	2,870	2,870	2,870
Combustion Chamber Temp., Avg.	°F	1,523	1,522	1,523	1,523

Table 5
Riverbend Landfill Flare Outlet FLRN B – Gaseous Emissions Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 13, 2011	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		09:59	13:35	16:31	
End Time		11:44	15:10	18:44	
Sampling Results					
CO Concentration	ppmv	21	17	14	17
Rate	lb/hr	4.4	3.4	2.4	3.4
Production-Based Rates	lb/MMscf	25.3	19.7	14.0	19.7
	lb/yr	38,178	29,774	21,048	29,667
Fuel-Based Rates	lb/MMBtu	0.048	0.038	0.027	0.038
NO_x Concentration	ppmv	18	17	21	19
Rate	lb/hr	6.1	5.8	6.0	6.0
Production-Based Rates	lb/MMscf	35.4	33.9	34.9	33.2
	lb/yr	53,307	51,967	52,599	52,359
Fuel-Based Rates	lb/MMBtu	0.067	0.065	0.067	0.066
SO_2 Concentration	ppmv	21	20	25	22
Rate	lb/hr	10.2	9.5	10.3	10.0
Production-Based Rates	lb/MMscf	58.9	54.9	59.8	57.9
	lb/yr	88,873	82,791	90,133	87,265
Fuel-Based Rates	lb/MMBtu	0.11	0.10	0.11	0.11
TRS as H_2S Converted To SO_2	ppmv	310	310	310	310
Rate	lb/hr	8.7	8.7	8.7	8.7
Production-Based Rates	lb/MMscf	50.7	50.7	50.7	50.7
	lb/yr	76,400	76,400	76,400	76,400
Fuel-Based Rates	lb/MMBtu	0.097	0.097	0.097	0.097
TGOC Concentration	ppmv-C_3H_8	2.5	0.7	0.6	1.3
Conc. Corr. to 3% O_2	ppmv-C_6	4.0	1.1	1.1	2.7
Rate	lb-C_6/hr	0.81	0.21	0.17	0.39
Production-Based Rates	lb-C_6/MMscf	4.7	1.2	1.0	2.3
	lb-C_6/year	7,051	1,821	1,489	3,454
Fuel-Based Rates	lb/MMBtu	0.0089	0.0023	0.0019	0.0044
O_2	%	14.8	14.6	13.7	14.4
CO_2	%	5.5	5.5	6.4	5.8
Flow Rate, EPA M 19, (Standard)	dscf/min	48,400	46,800	40,700	45,300
EPA M19 Calculated F-Factor	dscf/MMBtu	9,412.1	9,412.1	9,412.1	9,412.1

Table 6
Riverbend Landfill Flare Outlet Combined FLRN A and FLRN B
PM and Opacity - Averaged Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 12-14, 2011	**Units**	**Flare A**	**Flare B**	**Sum/Avg**
Sampling Results				
PM (Less Sulfates)				
Filterable PM Concentration	gr/dscf	0.00041	0.00065	0.00062
Rate	lb/hr	0.023	0.25	0.27
Production-Based Rates	lb/MMscf	0.71	1.5	1.4
	lb/yr	198	2,188	2,386
Condensable PM Concentration	gr/dscf	0.00044	0.00072	0.00069
Rate	lb/hr	0.024	0.28	0.30
Production-Based Rates	lb/MMscf	0.76	1.6	1.5
	lb/yr	208	2,411	2,619
Total PM Concentration	gr/dscf	0.00085	0.0014	0.0013
Rate	lb/hr	0.046	0.53	0.57
Production-Based Rates	lb/MMscf	1.5	3.1	2.9
	lb/yr	406	4,599	5,005
PM (Dehydrated)				
Filterable PM Concentration	gr/dscf	0.00041	0.00065	0.00062
Rate	lb/hr	0.023	0.25	0.27
Production-Based Rates	lb/MMscf	0.71	1.5	1.4
	lb/yr	198	2,188	2,386
Condensable PM Concentration	gr/dscf	0.0037	0.0022	0.0024
Rate	lb/hr	0.21	0.86	1.1
Production-Based Rates	lb/MMscf	6.5	5.0	5.2
	lb/yr	1,829	7,561	9,390
Total PM Concentration	gr/dscf	0.0041	0.0029	0.0030
Rate	lb/hr	0.23	1.1	1.3
Production-Based Rates	lb/MMscf	7.2	6.5	6.6
	lb/yr	2,028	9,749	11,776
PM (ODEQ 5)				
Filterable PM Concentration	gr/dscf	0.00041	0.00065	0.00062
Rate	lb/hr	0.023	0.25	0.27
Production-Based Rates	lb/MMscf	0.71	1.5	1.4
	lb/yr	198	2,188	2,386
Condensable PM Concentration	gr/dscf	0.0068	0.0036	0.0040
Rate	lb/hr	0.38	1.4	1.8
Production-Based Rates	lb/MMscf	11.8	8.0	8.5
	lb/yr	3,317	12,075	15,392
Total PM Concentration	gr/dscf	0.0072	0.0042	0.0046
Rate	lb/hr	0.40	1.6	2.0
Production-Based Rates	lb/MMscf	12.5	9.5	9.8
	lb/yr	3,516	14,263	17,778
Flow Rate (Standard) EPA M19	dscf/min	6,440	45,300	51,800
EPA M19 Calculated F-Factor	dscf/MMBtu	9,433	9,412	9,423

Table 7
Riverbend Landfill Flare Combined Outlet FLRN A & FLRN B
Gaseous Emissions – Averaged Test Results
Using EPA Method 19 Flow Rate Calculations

Test Date: April 12-14, 2011	**Units**	**Flare A**	**Flare B**	**Sum/Avg**
Sampling Results				
CO Concentration	ppmv	24	17	18
Rate	lb/hr	0.70	3.4	4.1
Production-Based Rates	lb/MMscf	21.5	19.7	19.9
	lb/yr	6,153	29,667	35,819
Fuel-Based Rates	lb/MMBtu	0.042	0.038	0.038
NO_x Concentration	ppmv	19	19	19
Rate	lb/hr	0.90	6.0	6.9
Production-Based Rates	lb/MMscf	27.6	34.7	33.8
	lb/yr	7,871	52,359	60,229
Fuel-Based Rates	lb/MMBtu	0.054	0.066	0.065
SO_2 Concentration	ppmv	27	22	23
Rate	lb/hr	1.8	10.0	11.7
Production-Based Rates	lb/MMscf	54.8	57.9	57.5
	lb/yr	15,619	87,265	102,884
Fuel-Based Rates	lb/MMBtu	0.11	0.11	0.11
TRS as H_2S Converted To SO_2	ppmv	450	310	380
Rate	lb/hr	2.4	8.7	11.1
Production-Based Rates	lb/MMscf	74.8	50.7	54.5
	lb/yr	21,300	76,400	97,700
Fuel-Based Rates	lb/MMBtu	0.15	0.097	0.10
TGOC Concentration	ppmv-C_3H_8	4.6	1.3	1.8
Conc. Corr. to 3% O_2	ppmv-C_6	0.8	2.7	2.4
Rate	lb-C_6/hr	0.22	0.39	0.61
Production-Based Rates	lb-C_6/MMscf	6.53	2.3	2.8
	lb-C_6/year	1,888	3,454	5,342
Fuel-Based Rates	lb/MMBtu	0.013	0.0044	0.0054
Flow Rate (Standard) EPA M2	dscf/min	6,720	45,300	52,000
EPA M19 Calculated F-Factor	dscf/MMBtu	9,436.5	9,412.1	9422.6

Table 8
Landfill Flare Inlet - Gas Composition & Flow Rate

Test Dates: April 12, 13, & 14, 2011	**Units**			
Test Date		**April 12**	**April 14**	**April 13**
Flare Inlet Location		FLRN A	FLRN A	FLRN B
Sampling Results				
Hydrogen	% vol	0.08	0.09	0.09
O_2 + Argon	% vol	0.91	1.95	1.12
CO_2	% vol	35.37	33.73	35.99
N_2	% vol	11.22	15.98	10.92
Methane	% vol	52.3	48.09	51.69
H_2S	% vol	0.04	0.04	0.03
Net Heating Value	Btu/lb	6,636.8		6,571.4
Three-Run Average Results				
Flow Rate (Actual)	acf/min	543.5	549.2 [14]	3,314
Flow Rate (Standard)	dscf/min	530.0	534.6	3,003
Temperature	°F	74	68	81
Moisture (Psychrometry)	%	2.2	2.1	2.5

3.2 Description of Collected Samples:

FLRN A:

PM Filters: White, Tan, or Spotted

Impinger Contents: Clear

FLRN B:

PM Filters: Gray

Impinger Contents: Clear

[14] The inlet flow rate for April 14, 2011 was a two-run average.

3.3 Discussion of Errors and Quality Assurance Procedures: This table is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements," by R.T. Shigehara, W.F. Todd and W.S. Smith. It summarizes the maximum error expressed in percent, which may be introduced into the test procedures by equipment or instrument limitations.

Measurement	**% Max Error**
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gauge Pressure Ps	0.42
Meter Gauge Pressure Pm	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head ΔP	10.0
Orifice Pressure Differential ΔH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

3.3.1 Manual Methods: QA procedures outlined in the test methods were followed, including equipment specifications and operation, calibrations, sample recovery and handling, calculations and performance tolerances.

On-site quality control procedures include pre- and post-test leak checks on the sampling system and pitot lines. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. The results of the leak checks for the test runs are on the Field Data sheets in the LFG Flare Outlet PM Section.

Thermocouples used to measure the exhaust temperature are calibrated in the field using EPA Alternate Method 11. A single-point calibration on each thermocouple system using a reference thermometer is performed.

Thermocouples must agree within ±2°F with the reference thermometer. Also, prior to use, thermocouple systems are checked for ambient temperature before heaters are started or readings are taken. Pitots are examined before and after each use to confirm that they are still aligned. The results were within allowable tolerances. Pre- and post-test calibrations on the meter boxes are included with the report in the Calibrations Section, along with semi-annual calibrations of critical orifices, pitots, nozzles, and thermocouples (sample box impinger outlet and oven, meter box inlet and outlet, and thermocouple indicators), as specified by ODEQ.

3.3.2 Continuous Analyzer Gas Sampling: The QA procedures from EPA Method 7E in Title 40 CFR Part 60, Appendix A, July, 2007 were done for O_2, CO_2, CO, NO_x and SO_2 gas analyses. QA procedures from EPA Method 25A in Title 40 CRF Part 60 were followed for TGOC gas analysis. Analyzer system checks are noted on the Calibration Field Record sheet, with procedures documented in the QA/QC section in the Appendix. All calibration standards used in the testing were EPA Protocol 1 with the exception of ultrapure nitrogen used to zero the O_2, CO_2, CO, NO_x and SO_2 gas analyzers. Certificates for the gases are in the Appendix.

3.3.3 Audit Requirement: The EPA Stationary Source Audit Sample Program was restructured and promulgated on September 30, 2010 and was made effective 30 days after that date. The Standard requires that the Facility or their representative order audit samples from an accredited Provider. Currently there are no accredited audit sample providers, and therefore no audit samples are available. If samples are not available, then audit sample analysis is not required for the EPA methods used for compliance testing. The TNI website www.nelac-institute.org/ssas/ will be referred to for a list of available accredited audit providers and audits.

3.3.4 EPA and ASTM Methods Laboratory QA: QA results are in the respective Columbia Analytical Services laboratory reports. Field blanks, method blanks, duplicate analysis, and laboratory control samples were within acceptable limits.

4. SOURCE DESCRIPTION AND OPERATION

4.1 Process and Control Device Description and Operation:

Riverbend Landfill operates a landfill gas (LFG) enclosed flare constructed by Perennial Energy and installed in 2010. The flare is used to combust the excess LFG that is not used to produce energy by the six LFG internal combustion engines on site. It is identified in the permit as EU ID FLRN. The flare has dual chambers with a burner ratio of approximately 6:1 between the two. Each chamber is equipped with a LFG inlet and flow meter. The smaller chamber (FLRN A) has a design inlet capacity of 700 cubic feet per minute (cfm). The larger chamber (FLRN B) is designed to automatically startup when the LFG inlet rate exceeds 700 cfm. As FLRN B starts up, FLRN A shuts down. FLRN B is designed to run independently of FLRN A until the LFG inlet rate exceeds 2000 cfm. Above 2000 cfm, FLRN A and FLRN B run simultaneously. Although the total design inlet capacity for FLRN is 4000 cfm, the normal operating range is limited to <2000 cfm because the LFG is primarily consumed by the engines. During testing of FLRN A, FLRN A ran alone and at 90% of its design capacity. During testing of FLRN B, FLRN B also ran alone and at 90% of its normal maximum capacity.

4.2 Test Ports: Port and traverse point locations are described and diagrammed on the Field Data sheets in the LFG Flare Outlet PM Section and the Flare Inlet Flow Section. Characteristics of each sample location are summarized in the following section. For FLRN A, PM and gases were sampled from three ports. PM and gas sampling was traversed over six points per port. For FLRN B, sampling was from four ports. PM and gases were sampled from traverses of six points per port. Descriptions and discussion of the criteria for these sampling locations, ports, and traverses are in Sections 5.1.3 and 5.1.4.

4.2.1 Test Duct Characteristics:

FLRN A Outlet, Ports 1 and 3:
Construction: Steel
Shape: Circular
Size: 112" depth
Orientation: Vertical
Flow straighteners: None
Extension: None
Cyclonic Flow: Average null angle was less than 20° indicating cyclonic flow was not present
Meets EPA M-1 Criteria: No

FLRN B Outlet:
Construction: Steel
Shape: Circular
Size: 159.13 inches inside diameter
Orientation: Vertical
Flow straighteners: None
Extension: None
Cyclonic Flow: Average null angle was less than 20° indicating cyclonic flow was not present
Meets EPA M-1 Criteria: No
No. of Ports: 4

FLRN B Inlet:
Construction: Steel
Shape: Circular
Size: 110.75 inches inside diameter
Orientation: Horizontal
Flow straighteners: None
Extension: None
Cyclonic Flow: None expected
Meets EPA M-1 Criteria: Yes, but does not meet minimum diameter of 12 inches.
No. of Ports: 2

FLRN A Outlet, Port 2:
Construction: Steel
Shape: Circular
Size: 25.3" depth
Orientation: Vertical
Flow straighteners: None
Extension: None
Cyclonic Flow: Average null angle was less than 20° indicating cyclonic flow was not present
Meets EPA M-1 Criteria: No

FLRN A Inlet:
Construction: Steel
Shape: Circular
Size: 4 inches inside diameter
Orientation: Horizontal
Flow straighteners: None
Extension: None
Cyclonic Flow: Not expected
Meets EPA M-1 Criteria: Yes, but does not meet minimum diameter of 12 inches.
No. of Ports: 2

4.3 Process & Control Equipment Flow Diagram: See Process/Sampling Equipment Flow Diagram in Appendix.

4.4 Operating Parameters: See. Data in the Production/Process Data section of the Appendix contain summaries of flare temperatures and landfill flare gas flow. The minimum, maximum, and average are provided for each run, during PM runs and during gas runs.

The position of the air louver is normally 50% open.

4.5 Process Startups/Shutdowns or Other Operational Changes During Tests: Process was continuous during testing.

4.6 On-Site Photograph:

Figure 1
Sampling at Flare Outlet

5. SAMPLING AND ANALYTICAL PROCEDURES

5.1 Sampling Procedures:

5.1.1 Sampling and Analytical Methods: Testing was in accordance with procedures and methods listed in the Source Test Plan dated February 15, 2011 (see Correspondence Section in the Appendix), including the following: EPA Methods in 40 CFR Part 60, Appendix A, July 1, 2008 and the Emission Measurement Technical Information Center's website, Test Methods Section (www.epa.gov/ttn/emc); ODEQ methods in Source Sampling Manual Volume 1, January, 1992;

Flare Outlet: Non-simultaneous testing of FLRN A & FLRN B

Flow Rate:	EPA Methods 1 and 2 (S-type pitot w/particulate traverses)
Rate:	EPA Method 19 (using fuel consumption, EPA Fd factors and O_2)
CO_2 and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	EPA Method 4 (incorporated w/ isokinetic sampling method)
PM:	ODEQ Method 5 (filterable and condensable PM; isokinetic impinger train technique; and sulfur correction of EPA Method 202)
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)
NO_x:	EPA Method 7E (chemiluminescent analyzer)
Opacity:	EPA Method 9 (six minutes per test)
CO:	EPA Method 10 (gas filter correlation analyzer)
VOC (TGOC):	VOC as total gaseous organic compounds (TGOC) by EPA Method 25A (heated flame ionization analyzer and sample line)

Flare Inlet: Concurrent with testing FLRN A & FLRN B

Btu content:	ASTM D3588-98 (Tedlar bags with analyses by GC/FID, GC/TCD and GC/SCD)
TRS as H_2S:	ASTM D5504-08 for total reduced sulfur (TRS) content as hydrogen sulfide (H_2S) (integrated Tedlar bag samples with analysis by GC/SCD)

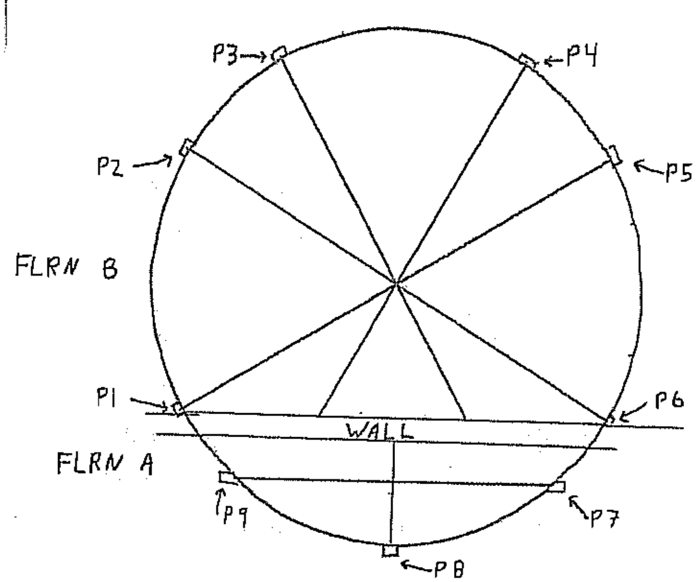
5.1.2 Number of Sampling Replicates and their Duration: Three valid PM test runs of 126 minutes (FLRN A) or 120 minutes (FLRN B) were completed. Five valid gaseous test runs of 60 minutes per run were completed for FLRN A and three runs were completed for FLRN B. The gaseous runs were done concurrent with the particulate runs, timed to avoid sharing ports between PM and gas samplers. Tedlar bags taken at the inlet were integrated over the entire day at each location.

5.1.3 Allowed Variances to Methods: The following requests for variances from EPA standards were approved by ODEQ, with documentation in the Correspondence section of the report.

5.1.3.1 EPA Method 1 Criteria Location: Raimond Peterson of ODEQ approved Horizon Engineering's proposed sampling locations for the flare outlet, as outlined in the original Source Test Plan. FLRN A and FLRN B are divided by a wall that runs the length of the exhaust duct. The wall splits the circular duct into segments, therefore the location of the test ports do not meet EPA Method 1 and 2 criteria.

FLRN A has three test ports and FLRN B has six test ports, as shown in Figure 2. The areas of each zone were calculated during the testing setup, accounting for the thickness and location of the dividing wall. Example calculations are in the Appendix.

Figure 2
Flare Outlet Ports



The presence of the wall and the current configuration of the ports create 12 segments in FLRN A and 8 sectors in FLRN B. Details for the segments were provided in the Source Test Plan in the Appendix.

A flow survey done by Horizon Engineering on February 4, 2011 and documented in the Source Test Plan, showed that current port configuration could provide enough data points to adequately report the flow rate measured by EPA Method 2 for both FLRN A and FLRN B. For FLRN A ODEQ Method 5, 18 traverse points were sampled; for FLRN B ODEQ Method 5, 24 traverse points were sampled; 6 per sector.

Because the exhaust temperature of the FLRN B is approximately 1300°F and the diameter is approximately 13 feet, and long probes in these conditions make it difficult to sample successfully, Horizon proposed sampling with shorter probes and sampling from four ports. This was discussed between Joseph M. Heffernan III of Horizon Engineering and Michael Eisele of ODEQ. ODEQ allowed ODEQ Method 5 sampling through ports P_1, P_3, P_5 and P_6.

5.1.3.2 <u>ODEQ Method 5 PM Sampling:</u> The sources were tested by ODEQ Method 5 as stated in the facility's permit. Sources with sulfur dioxide in the gas stream are normally allowed to use EPA Method 202 which has a provision for subtracting the SO_2 that is likely to condense in the back half impinger water and form sulfate artifacts, biasing the results high. Horizon requested a modification to ODEQ Method 5, based on sulfate subtraction procedures in EPA Method 202 (version prior to the latest revision). ODEQ granted approval for sulfate subtraction and specifically to subtraction of SO_4 measured by analysis of the inorganic portion of the ODEQ Method 5 samples. These samples were shipped to Enthalpy Analytical for sulfate analysis after the Antech laboratory completed the normal ODEQ5 analysis. Results of this modification to the PM testing are discussed below in Section 5.1.4.

5.1.4 <u>Sampling and Analysis Discussions:</u>

5.1.4.1 <u>Criteria Location and Flow Rates:</u> Both FLRN A and FLRN B duct air flow measuring locations do not meet criteria in EPA Methods 1 and 2, but pre-test flows and calculations provided in the Source Test Plan were accepted by ODEQ as alternatives. The stack exhausts are truncated circular configurations and it cannot be verified as to the accuracy or validity of the EPA Method 1 and 2 flow rates.

ODEQ also requested calculation of EPA Method 19 flow rates. These flow rate calculations are based on the landfill gas usage rate, recorded by Riverbend; on heating value (Btu/ft^3) determined by ASTM D3588-98 analysis; on fuel factor (dscf/MMBtu) obtained from analysis of inlet landfill gas in terms of concentrations of methane, O_2, CO_2, N_2, H_2S, H_2, CO; and finally on O_2 concentrations measured during the test by EPA Method 3A. In sum, landfill gas usage rate, inlet Tedlar bag sample and analysis and O_2 measurements are the variables which will determine the accuracy or representativeness of the EPA Method 19 results. All of the Horizon test QA results indicated that the sampling was valid. Columbia Analytical QA was within allowable parameters and the laboratory did not note any anomalies. The landfill gas usage data was verified by Riverbend in the form of calibrations for the metering system. Therefore the EPA Method 19 flow rates should be considered valid. Furthermore, Method 19 projects stack flow using fuel used (natural gas) during the entirety of the run. This provides a full picture of the average flow from the stack during the run and therefore levels out periods of high- and low-flow, resulting in an average flow for each run.

For FLRN A the EPA Method 2 flow rate was 16% higher than the EPA Method 19 flow rate. For FLRN B the EPA M2 flow rate was 16% lower than the EPA M19 flow rate.

As instructed by Raimond Peterson of ODEQ, results were calculated using both flow rates. Because the EPA Method 2 flows were taken from an irregular and non-criteria location we believe the EPA Method 19 flow rates are more accurate and reliable. Therefore for this reason and the reason given in the EPA Method 19 description above, results calculated with these flow rates are reported in the summary tables. The EPA Method 2 results are provided in the Appendix.

5.1.4.2 <u>Discussion of PM Results:</u> As mentioned earlier, sources with SO_2 in the gas stream are normally allowed to use EPA Method 202 which has procedures for subtracting the SO_2 that is likely to condense in the back half impinger water and form sulfate artifacts, biasing the results high. EPA Method 202 recommends the sulfur correction for sources with water samples lower than pH 4.5. The sulfur dioxide correction in EPA Method 202 has two parts. First, the sample train is purged with N_2 at the end of the run to remove as much dissolved SO_2 as possible from the impinger water before the SO_2 forms H_2SO_4. The second part of the procedure is done at the laboratory. An aliquot of the inorganic condensable sample (impinger water after organics removed by methylene chloride extraction in accordance with ODEQ Method 5) is analyzed for SO_4 concentration by IC. Then the aliquot is dried down, reconstituted with NH_4OH to drive off the water molecules held by H_2SO_4. This is done to remove the weight added by the water molecules from creating a high bias. The sample is dried again and this last dry weight is corrected for the weight of ammonia added.

The first part of the procedure, the N_2 purges, was not done because ODEQ 5 was the specified method to use and because ODEQ did not approve the use of EPA Method 202 until after field testing was completed. During testing the technicians measured the pH of the impinger water, obtaining values of 2 or 3, indicating the presence of SO_2 and within the values where EPA Method 202 sulfur correction is recommended. ODEQ permission was granted to proceed with the second part of the M202 sulfur correction. Additional permission was given to use the IC analysis for SO_4 because the purge was not done. The inorganic PM samples from the ODEQ5 analysis were shipped to Enthalpy Analytical, who performed inorganic condensable particulate analysis by HPLC/IC for sulfate.

The PM was calculated by three methods. First, PM was calculated using procedures in ODEQ5, including all normal filterable and condensable measured weights. Second, a "dehydrated" value for PM was obtained using the front filterable and organic condensable weights from ODEQ5 analysis and the inorganic fraction measured by Enthalpy Analytical after H_2SO_4 was removed by an ammonium procedure in EPA Method 202 and the sample was dried. The third PM value was obtained from the front filterable and organic condensable weights from ODEQ5 analysis, the inorganic fraction measured by Enthalpy Analytical after dehydration, and subtraction of sulfates measured by Enthalpy Analytical.

The highest PM results were obtained from ODEQ 5; a middle value was obtained from the dehydrated method, and the lowest from the sulfate subtraction. For FLRN A, ODEQ 5 PM total averaged 50 mg, the dehydrated total averaged 29 mg; the total after SO_4 was subtracted from the dehydrated results was 6 mg. This is a 78% reduction from ODEQ5 to sulfate subtracted results. For FLRN B, ODEQ 5 PM total averaged 24 mg, the dehydrated total averaged 16 mg; the total after SO_4 was subtracted from the dehydrated results was 8 mg; a 67% reduction from ODEQ5 to sulfate subtracted results.

We believe the PM sampling for this Flare should have a standard sulfur correction as indicated by the presence of measurable SO_2 in the exhaust gas: average concentrations of 27ppm were measured in FLRN A and 22 ppm in FLRN B resulting from sulfur concentrations in the raw landfill gas over 300 ppmv.. The pH of the impinger water was very acidic indicating SO_2 captured in the water.

5.1.5 Sampling and Analysis Notes:

5.1.5.1 FLRN A PM Replicate Runs: FLRN A PM results are based on three runs, Runs 1, 3, and 4. There were five runs completed but two runs were definitely invalid. Run 2 sample train did not pass the post-test leak check and the probe for Run 5 contacted the flare wall insulation potentially contaminating the sample. All of the operations and QA checks for Runs 3 and 4 indicated good runs. For Run 1 the testers discovered that the Teflon filter support had partially melted or softened (not charred) sometime during the run. We do not believe this would have a significant effect on the amount of PM collected. Because filterable PM material could have bypassed the filter and collected in the condensable portion of the train it would not be possible to make an accurate and defendable distinction between filterable and condensable PM. However, PM permit limits and emission factors are based on total PM. There were no other operation or QA issues with this run, so we have included Run 1 in the average.

5.1.5.2 Gaseous Emissions Results: The gas stream for both FLRN A and FLRN B were stratified and there was variability in the concentrations of CO, NO_x, SO_2 and TGOC (continuous analyzer methods) from port to port as would be expected in a stratified stream. For run-to-run variation, the gas concentrations for both flares were consistent, except perhaps TGOC which varied between 1.3 and 4.8 ppm for FLRN A, but the detection limit for TGOC by EPA Method 25A (2% of span gas concentration of 50 ppm) is 1 ppm. It is not uncommon for results near the detection limit level to show this much variation.

For FLRN A, April 12, 2011 Run 2, the bias check was 12.6% and the drift check was 13.6% for TGOC. The bias checks for EPA 25A are required to be 5%, and the drift limit is 3%. We drift corrected for this run and do not believe this to be a significant deviation or that it will add a significant bias to the results (which were well below permit limits and emission factors).

5.1.5.3 Landfill Gas Flow Data For FLRN A Run 4 on April 14, 2011 the landfill gas flows averaged 356 scfm for the first part of the run (between 08:33 and 09:15) and averaged 543 scfm for the remainder of the run (09:15 to 10:48). These data have been confirmed by Riverbend as accurate and therefore we used the average flow rate for EPA Method 19 flow rate calculations and emission factor (lb/MMscf LFG) results.

TRS Tedlar Bag Sampling: TRS concentrations as measured by one integrated Tedlar bag sample per day were 450 ppm for FLRN A (on both test days) and 310 ppm for FLRN B. Because there is variability in the two concentrations, all sampling and laboratory procedures were double-checked and no anomalies were noted.

5.1.6 Laboratory Analysis:

Analyte	Laboratory
PM	Antech, Corbett, OR
PM Sulfates	Enthalpy Analytical, Inc. Durham NC
TRS as H_2S, Inlet Fixed Gases	Columbia Analytical Services, Simi Valley, CA

5.2 Sampling Train Diagrams:

Figure 3

ODEQ Method 5 Particulate Matter Sample Train Diagram

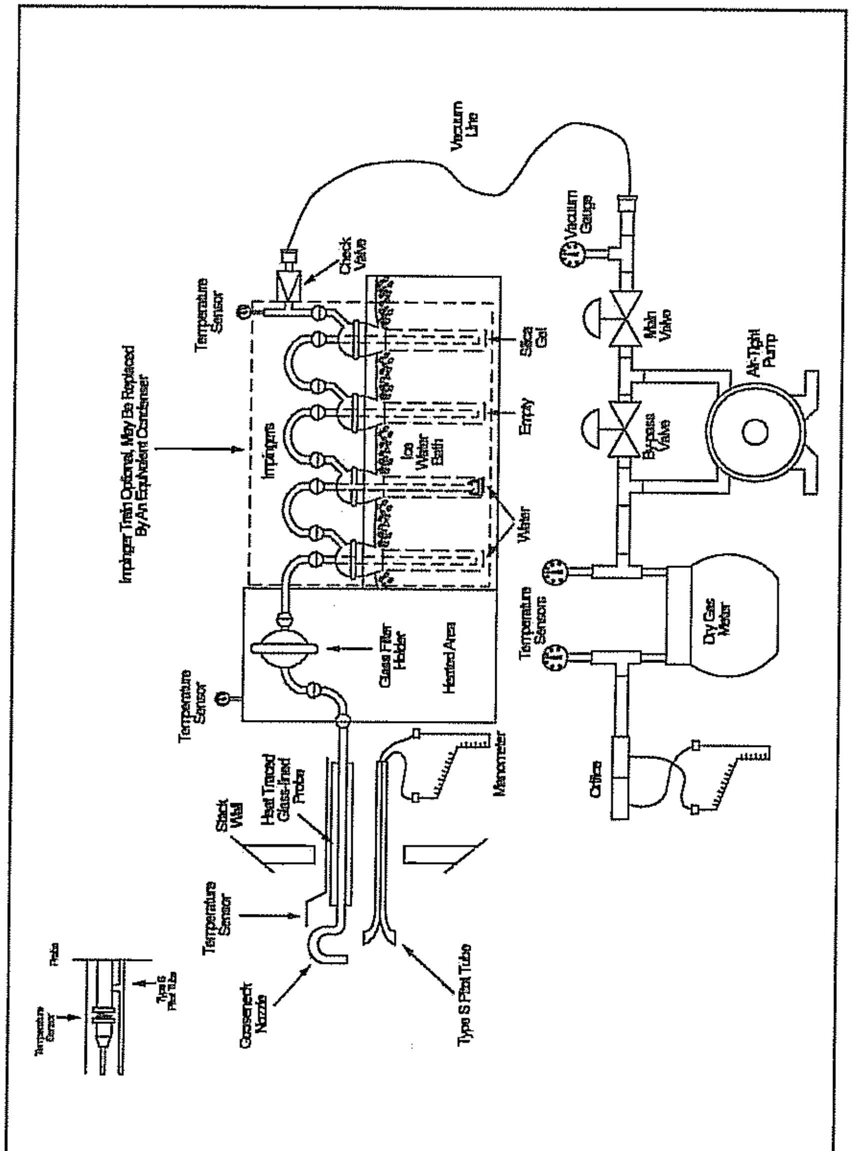


Figure 5-1. Particulate Sampling Train.

Figure 4

EPA Methods 3A, 6C, 7E, & 10 Analyzer Sample System Diagram

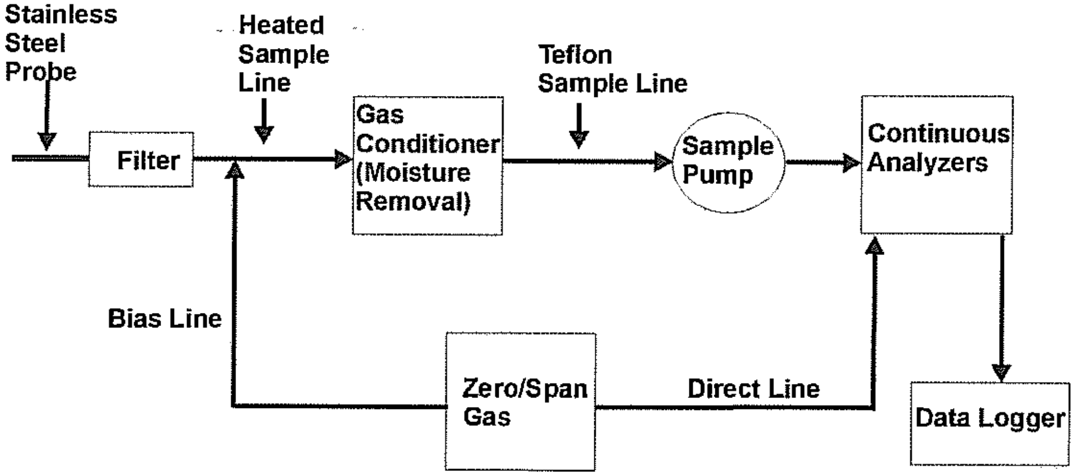
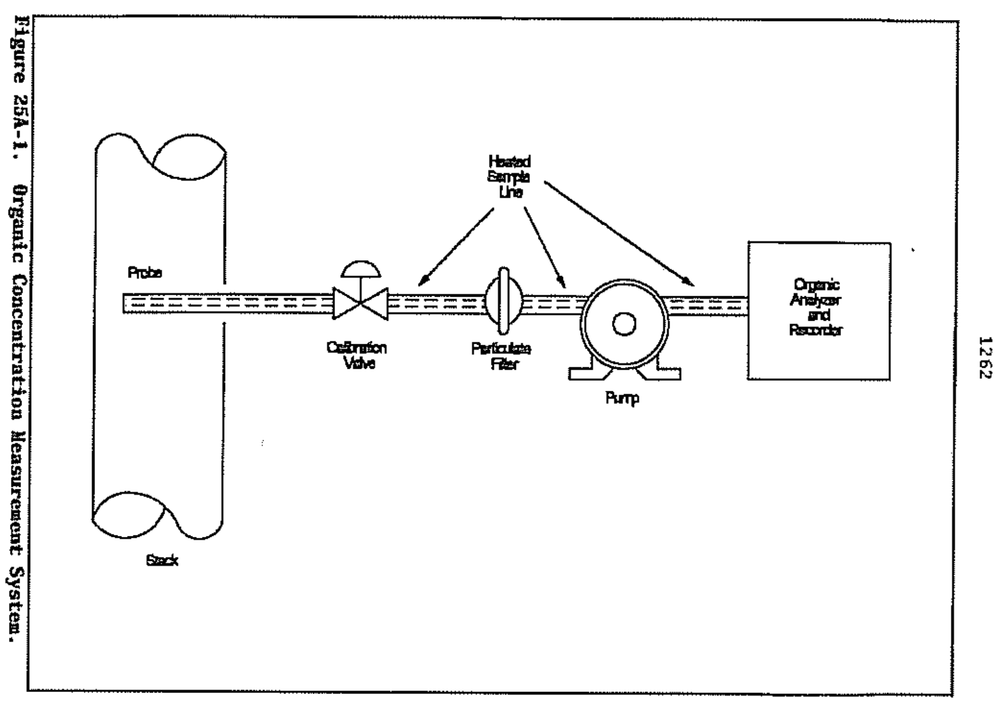


Figure 5

EPA Method 25A VOC Analyzer Sample System Diagram



5.2.1 Method 25A Diagram Exception: No particulate filter used.

5.3 Horizon Test Equipment:

5.3.1 Manual Methods:

Equipment Name	**Identification**
Isokinetic Meter Box	Apex Instruments, Horizon No. 20
Probe Liner(s)	Quartz
Pitots and Thermocouples	5-15, 5-14, 6s-, SR-36
Magnehelic Gauge	2-D
Shortridge® Micromanometer	SR-6
Quartz Nozzles	See ODEQ Method 5 Field Data
Barometer	Test Van II

5.3.2 CEM Analyzers and Methods:

Gas	**Brand**	**Model**	**Cal. Span**	**Measurement Method**	**Method**
O_2	CAI	601P	22.22%	Paramagnetic	3A
CO_2	CAI	601P	21.23%	NDIR	3A
CO	Thermo Env	48	98.4 ppm	Gas Filter Correlation	10
NO_x	Thermo Env	42C	97.9 ppm	Chemiluminescent	7E
SO_2	West. Resch	721M	93.9 ppm	Non-Dispersive Ultraviolet	6C
			Range		
TGOC	J.U.M.	3-300A	0-50 ppmC_3H_8	Flame Ionization	25A

5.3.3 CEMS Sampling Setup:

CO_2, O_2, CO, NO_x, SO_2 Sampling:

Sample Location(s):	Traversed at twelve points in accordance with Table 1-1 or 1-2 of EPA Method 1
Probe:	Heated Stainless
Conditioning:	Refrigerated MAK 6 cooler
Sample Line(s):	Teflon (heated to sample conditioner & unheated to pump)
Pump:	Teflon lined
Data Logger:	Keithley (PC based) with Test Point software

TGOC Sampling:

Sample Location(s):	Traversed at twelve points in accordance with Table 1-1 or 1-2 of EPA Method 1
Probe:	Heated Stainless
Conditioning:	None
Sample Line(s):	Teflon, heated
Pump:	Heated, internal to analyzer
Data Logger:	Keithley (PC based) with Test Point software

5.3.4 Bag Sampling Setup:

Integrated Tedlar bag samples were taken:

Probe:	Stainless steel
Sample Line:	Teflon
Pump:	Positive Pressure of Gas Stream

6. DISCUSSION

The results of the testing should be valid in most respects, as qualified by discussions of flow rates and PM results in Section 5.1.4. All quality assurance checks including leak checks, instrument checks, and calibrations, were within method-allowable tolerances.

jchristi@cecenv.com

From: TrackingUpdates@fedex.com
Sent: Monday, November 1, 2021 10:07 AM
To: jchristi@cecenv.com
Subject: FedEx Shipment 775067927410: Your package has been delivered

Hi. Your package was delivered Mon, 11/01/2021 at 10:05am.

Delivered to 1200 6TH AVE, SEATTLE, WA 98101
Received by D.LEIGH

OBTAIN PROOF OF DELIVERY

TRACKING NUMBER	775067927410
FROM	CARLSON ENV CONSULTANTS, PC 1015 4th Ave West Suite G OLYMPIA, WA, US, 98502
TO	US EPA Region 10 Attn: Air Operating Permits

1200 6TH AVE
Mail Stop OAQ-108
SEATTLE, WA, US, 98101

REFERENCE	101.78.23 RB XXX/AAAA Design P
SHIPPER REFERENCE	101.78.23 RB XXX/AAAA Design P
SHIP DATE	Fri 10/29/2021 11:48 AM
DELIVERED TO	Mailroom
PACKAGING TYPE	FedEx Box
ORIGIN	OLYMPIA, WA, US, 98502
DESTINATION	SEATTLE, WA, US, 98101
SPECIAL HANDLING	Deliver Weekday
NUMBER OF PIECES	1
TOTAL SHIPMENT WEIGHT	1.00 LB
SERVICE TYPE	FedEx Standard Overnight

FOLLOW FEDEX

jchristi@cecenv.com

From:	TrackingUpdates@fedex.com
Sent:	Monday, November 1, 2021 10:09 AM
To:	jchristi@cecenv.com
Subject:	FedEx Shipment 775067879996: Your package has been delivered

FedEx

Hi. Your package was delivered Mon, 11/01/2021 at 10:07am.

Delivered to 4026 FAIRVIEW INDUSTRIAL, SALEM, OR 97302
Received by L.OGILVIE

OBTAIN PROOF OF DELIVERY

TRACKING NUMBER	775067879996
FROM	CARLSON ENV CONSULTANTS, PC 1015 4th Ave West Suite G OLYMPIA, WA, US, 98502
TO	Oregon DEQ - Western Region Attn: Yuki Puram

4026 FAIRVIEW INDUSTRIAL DR SE
SALEM, OR, US, 97302

REFERENCE	101.78.23 RB XXX/AAAA Design P
SHIPPER REFERENCE	101.78.23 RB XXX/AAAA Design P
SHIP DATE	Fri 10/29/2021 11:48 AM
DELIVERED TO	Receptionist/Front Desk
PACKAGING TYPE	FedEx Box
ORIGIN	OLYMPIA, WA, US, 98502
DESTINATION	SALEM, OR, US, 97302
SPECIAL HANDLING	Deliver Weekday
NUMBER OF PIECES	1
TOTAL SHIPMENT WEIGHT	1.00 LB
SERVICE TYPE	FedEx Standard Overnight

FOLLOW FEDEX

ATTACHMENT 2

ENHANCED SEM TRAINING HANDBOOK

Riverbend Landfill Co

Enhanced Surface Emissions Monitoring Training

October 2021

Overview and Purpose of Training

This training presentation was prepared in accordance with Paragraph 63 of the Administrative Compliance Order on Consent, Docket Number CAA-10-2021-0055 (ACO). The presentation covers the following procedures included in the ACO:

- Enhanced Surface Emission Monitoring Criteria
- Enhanced Exceedance Tracking
- Enhanced Exceedance Repair Procedures

All WM and contractor employees authorized to conduct enhanced surface emissions monitoring (Enhanced SEM) at the Riverbend Landfill must receive training prior to monitoring. Materials included with this training are as follows:

Attachment A – Enhanced SEM Presentation Slides

Attachment B – Riverbend SEM Plan

Attachment C – SEM Route

Attachment D – Penetration Map

Attachment E – Upwind/Downwind Measurement Points

Attachment F – LFG Migration Probe Map

Attachment A

Enhanced SEM Presentation Slides

Waste Management
October 2021

Enhanced Surface Emissions Monitoring Training

THINK GREEN.®

Operational Requirements

WASTE MANAGEMENT

Purpose

Train WM Employees and Contractors on Enhanced SEM Requirements

- Administrative Compliance Order between EPA and Riverbend Landfill
- Effective 9/10/21, 1 year term
- All personnel performing SEM must be trained on enhanced procedures

THINK GREEN.

Basic Principles for SEM Still Apply

- Same requirements for calibration
- Upwind/downwind background measurements (use staked locations)
- Path/Perimeter/Penetration Monitoring (SEM path and Current Penetrations included in attached maps)
- Exclusion of Dangerous Areas (steep/slippery areas, daily cover areas, active areas, etc.)
- Method 21 Procedures
- XXX/AAAA rules for repairs/rechecks of exceedances

Site SEM plan was recently updated. A copy of the plan is included with training materials

Enhanced SEM Requirements Overview

Enhanced SEM Adds Several Additional Requirements to Typical Monitoring Procedures

- SEM at probes
- GPS devices for recording monitoring route
- Method 21 Procedures
- Enhanced Exceedance Tracking Procedures
- Enhanced Exceedance Repair Procedures
- Verification Requirements

Surface Monitoring at Perimeter Landfill Gas Migration Probes

- Required on quarterly basis for 1 year
- Measure surface emissions at all perimeter landfill gas migration probes
- 10-foot radius of accessible area
- Document any measurements over 500 ppm_v

Method 21 Procedures

All SEM needs to follow Method 21 procedures

If increased readings (>300 ppm) or signs of elevated emissions outside the monitoring path are observed:

- Stop forward progress for at least 15 seconds
- Conduct monitoring at areas identified in most recent cover integrity monitoring event
- Make observations of cover
  - Distressed vegetation
  - Cracks/seeps/erosion
- Move toward visually identified areas
- Measure highest reading in the area
- If >500 ppm, follow Enhanced Exceedance Tracking Procedures, if <500 ppm, continue from stopping point

Enhanced Exceedance Tracking

Additional Procedures for Documenting Exceedances of 500 ppmv

- Use brightly colored pin flags with unique IDs
- Use several flags when documenting area exceedances
- Record location w/ GPS device accurate to 4 meters
- Take pictures of area showing general condition of area and/or penetrations
- Record flag number and GPS coordinates on field log
- Note the location, label ID, and concentrations on route map and field logs

- Contractor to download monitoring data daily
- Provide GPS data of path at regular intervals
- WM to add exceedances to exceedance log and generate work orders
- Complete repairs per Enhanced Exceedance Repair Procedures
- Complete remonitoring per Enhanced Exceedance Repair Procedures

Enhanced Exceedance Repair Procedures

- Exceedance Log Requirements
  - Date/Time, work order number, description, GPS location, corrective actions, remonitoring
- Work Order Requirements
  - Date, time of monitoring (surface, cover, penetration, etc), location description, GPS coordinates, methane readings, corrective actions, visual observations, pictures of initial/repaired conditions
- All 10-day/1-month remonitoring needs to cover a minimum 10-ft radius around the repair boundaries
  - Any 500 ppm exceedances observed within area count as an additional exceedance
- Corrective action plan and timeline required for any locations with three exceedances within the same quarter unless a new well is installed within 120 days of initial exceedance

Verification Procedures

Three Types of Verification Procedures to be Complated

WM Quarterly Verification of Enhanced SEM

- Conduct each quarter during ACO term
- Path taken and implementation of Method 21
- Documentation and reporting
- Corrective actions
- Monitoring data for feasibility and unusual trends
- Calibration records and equipment maintenance
- Recordkeeping

WM Observation of Contractor Monitoring

- 1-time event (Fourth Quarter 2021)
- Observe contractor in field while conducting monitoring
- Assess that contractor is following enhanced SEM using trained staff

Third Party Audit

- 1-time event (Fourth Quarter 2021)
- Conducted by SCS Engineers
- Audit of adherence to Enhanced SEM Procedures

Attachment B

Riverbend SEM Plan

RVIERBEND LANDFILL CO.
McMinnville OR.

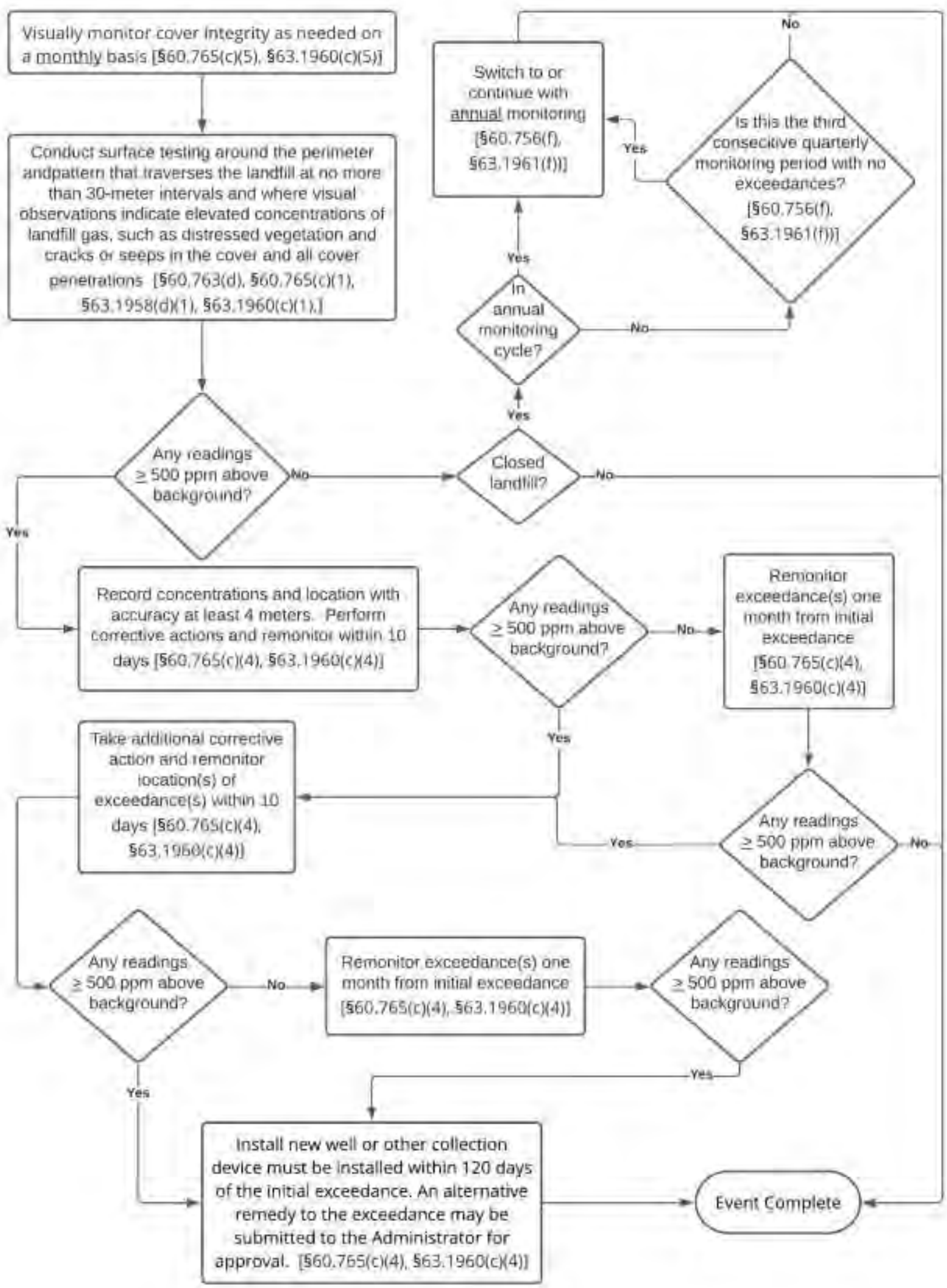
SURFACE EMISSIONS MONITORING PROTOCOL

CONTENTS

USEPA SURFACE EMISSIONS MONITORING FLOW CHART 3
INTRODUCTION 4
MONITORING ROUTE MEASUREMENTS 4
SURFACE EMISSIONS ROUTE MAP 5
DANGEROUS AREAS 6
MONITORING FREQUENCY 6
APPROVED EQUIPMENT 7
CALIBRATION GASES 7
CALIBRATION AND BACKGROUND READINGS 7
STANDARD CALIBRATION PROCEDURES 8
STEP 1: ASSEMBLE INSTRUMENT, POWER ON AND WARM UP 8
STEP 2: RESPONSE FACTOR 8
STEP 3: CALIBRATION OF INSTRUMENT (each time Before USe) 8
STEP 4: CALIBRATION PRECISION (every 3 months) 8
STEP 5: RESPONSE TIME (once before new commissioning) 9
STEP 6: UPWIND/DOWNWIND READINGS (before each use) 9
SCHEDULING OF MONITORING EVENT 11
MONITORING PROCEDURES 11
SURFACE EMISSIONS MONITORING 11
PENETRATION MONITORING 12
MONITORED EXCEEDANCE LOCATIONS 13
EXCEEDANCE REPAIR PROCEDURES 13
MONITORED EXCEEDANCE RECHECKS 14
1-MONTH RE-MONITORING 15
REPORT PREPARATION 16
COVER LETTER 16
FIGURE 1 SITE PLAN 16
TABLE 1 – SURFACE/Penetration/ MONITORING EXCEEDANCES AND CORRECTIVE ACTIONS 16
ATTACHMENT 1 – CALIBRATION RECORDS 16
ATTACHMENT 2 – CALIBRATION GASES CERTIFICATES OF ANALYSIS 16

ATTACHMENT A - SURFACE EMISSIONS MONITORING REFERENCE STANDARDS
ATTACHMENT B - SAMPLE CALIBRATION FORMS
ATTACHMENT C – SAMPLE EXCEEDANCE LOG

USEPA SURFACE EMISSIONS MONITORING FLOW CHART



INTRODUCTION

Monitoring procedures have been developed bythe United States Environmental Protection Agency (EPA) to help determine the effectiveness of active landfill gas (LFG) collection systems in reducing fugitive emissions from landfills.

Riverbend Landfill is required to perform Surface Emissions Monitoring (SEM) by New Source Performance Standards (NSPS) and National Emission Standards for HazardousAir Pollutants (NESHAP) regulations. Surface Emissions Monitoring is required for all landfill areas/locations that contain a LFG collection and control system subject to NSPS and NESHAP. Riverbend Landfill is subject to 40 CFR 60, Subpart XXX. Surface Emissions Monitoring is to be performed as specified in 40 CFR §60.765 (c) and (d), and 40 CFR 60, Appendix A, Method 21 (see Attachment A for rule language and Method 21). Riverbend Landfill is *also* subject to 40 CFR 63, Subpart AAAA (NMOC emission rate equal to or greater than 50 Mg/yr), Surface Emissions Monitoring is to be performed as specified in 40 CFR §63.1958(d), §63.1960 (c) and (d) and §63.1961(f).

These regulations require surface monitoring around the perimeter and within the active LFG collection area where waste exceeds two years in age at final grade or five years in age at interim grades.

This plan does not address changes to Surface Emissions Monitoring that will be required under the newly adopted Landfill Methane Rule, OAR Chapter 340, Division 239. The monitoring requirements do not go into effect until August 1, 2022. This plan will be updated prior to implementing these requirements.

MONITORING ROUTE MEASUREMENTS

The following landfill areas are monitored during each SEM and penetration monitoring event at Riverbend Landfill:

- The entire perimeter of the landfill collection area.
- All areas of waste placement that exceed two years in age or are at final grade or are five years in age at interim grades.
- Measurements are taken along a 30-meter serpentine path.
- Measurements are taken in areas where visual observations indicate elevated concentrations of LFG (such as distressed vegetation and cracks or seeps in the cover). See Monitoring Procedures section.

As Riverbend Landfill is subject to 40 CFR 60, Subpart XXX and 40 CFR 63, Subpart AAAA, see Monitoring Procedures section. The following general requirements also apply:

- If a monitoring exceedance is observed (>500 ppmv), the technician will follow the procedures in the Monitored Exceedance Location section.

- All “penetrations” on the landfill in the LFG collection area must be included in the monitoring.

SURFACE EMISSIONS ROUTE MAP

A surface emissions monitoring plan is required as part of the site’s NSPS GCCS Design Plan. The surface emissions monitoring plan provided in the NSPS GCCS Design Plan is developed based on the proposed final waste grades. Prior to the landfill reaching final grades, interim surface emissions routes are used to cover the current fill areas of the landfill.

An interim surface monitoring route map has been developed for Riverbend Landfill. The route map includes a topographical map with the monitoring route applied to the surface. The interim route map identifies any areas of the landfill where deviations from the 30-meter intervals (i.e., exempted areas, etc.) occurred. The monitoring route has been developed for all areas within the active LFG collection area where waste exceeds two years in age at final grade or five years in age at interim grades and around the perimeter. Riverbend Landfill has no areas that are excluded from monitoring except for dangerous areas.

On April 6, 2020, Riverbend Landfill became subject to NSPS XXX and NESHAP AAAA including cover penetration monitoring. Riverbend Landfill has prepared a surface penetration drawing that identifies all cover penetrations required to be monitored. This drawing is used to locate penetrations, confirm quarterly penetration monitoring, and identify which penetrations were excluded from monitoring due to dangerous areas. The drawing is reviewed and updated each quarter and records will be maintained with the surface monitoring route map.

The surface emissions route map, penetration, drawing will be provided to the contractor for review prior to monitoring at the site.

Since surface emissions monitoring is performed by a field technician on foot, the following should be considered when conducting the monitoring:

- Prepare the route in a downhill fashion
- Riverbend is large, monitoring routes are broken into several smaller routes
- Avoid any uphill climbs when possible
- Provide landmarks on the route map to guide technician along the route (e.g., LFG extraction wells)
- If the site is being actively filled, use recent topographic information to identify the location of active areas, roads, stormwater features, berms, etc.
- Perimeter of the landfill area is also required to be monitored.

DANGEROUS AREAS

Surface emissions monitoring may involve exposure to hazardous walking and working surfaces, hazardous materials, active landfilling operations, traffic and operating heavy equipment. Landfills can present certain physical hazards; therefore, there are areas that the technician should not monitor for their safety. Though these areas may be subject to NSPS/NESHAP and require monitoring the risks of monitoring these areas are too high. The regulations allow for the exclusion of these dangerous areas for the safety of the technician. It is the responsibility of the technician to establish appropriate safety and health practices and determine the applicability of regulatory limitations. These dangerous areas are discussed in detail below.

Riverbend Landfill defines the areas that would qualify as "Dangerous Areas" in compliance with 40 CFR §763(d). Areas that qualify as dangerous areas include but are not limited to: construction trenches or, snow or ice-covered slopes, exposed temporary cover tarps, roads, the working face, construction areas, and stockpiles (soil, rock, materials, etc.). If an area qualifies as dangerous, the technician will delineate on the route map the location of the dangerous area, and the reason it qualifies as dangerous.

Excluding NSPS/NESHAP areas from a surface scan should be limited; WM Area air program specialist, landfill operations personnel, and the surface scan technician should work together to monitor as much of the applicable NSPS areas as possible.

A minimum 150-foot buffer from active construction and filling areas must be maintained during the surface scan even though these areas may be subject to NSPS/NESHAP monitoring requirements. The landfill working face is considered a dangerous area, the landfill working face contains heavy traffic as well as uncompacted and uncovered waste all of which lead to dangerous conditions for the technician on foot. The technician will need to note the location of the active area(s)on the route map, and that the area(s) was/were not monitored.

MONITORING FREQUENCY

40 CFR §60.765(c)(1) and 40 CFR §63.1960(c)(1) require that surface emissions monitoring be conducted on the areas of the landfill subject to NSPS and NESHAPs regulations on a quarterly basis. Penetration monitoring will be conducted on the areas of the landfill subject to NSPS and NESHAPs regulations on a quarterly basis. However, as discussed in 40 CFR §60.766(f) and 40 CFR §63.1961(f), any closed landfill area that has no monitored exceedances in three (3) consecutive quarterly monitoring periods may convert to annual monitoring. Any methane reading of 500 ppmv or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

Riverbend Landfill has currently not identified any closed areas that are excluded from SEM. Riverbend Landfill defines a closed landfill area as any one of the following:

- Closed facility: a landfill in which solid waste is no longer being placed, and in which no additional solid wastes will be placed without first filing a notification of modification as prescribed under 40 CFR §60.761
- Closed Landfill located next to an active landfill.

- Closed Area of Landfill: an Agency-approved variance request is required to exclude closed areas at an active landfill from surface emission monitoring, unless the Landfill is a Closed Site.

The final report that is submitted for each surface monitoring event will clearly delineate the monitoring frequency of landfill areas at the Site if there are any on an annual monitoring schedule.

APPROVED EQUIPMENT

METHANE DETECTOR

Some examples of devices used for surface emissions monitoring include, but are limited to:

- Landtec QED SEM 5000: https://www.landtecna.com/product/sem5000-portable-methane-detector/

- Elkins Earthworks, LLC Irwin: https://elkinsearthworks.com/irwin/

- Thermo Scientific TVA2020 Toxic Vapor Analyzer: https://www.thermofisher.com/order/catalog/product/TVA2020#/TVA2020

CALIBRATION GASES

Calibration gases are used to calibrate the methane detector to a known value. The calibration gas is the reference compound at a known concentration approximately equal to the leak definition concentration. Under NSPS/NESHAP regulations, the reference compound is methane and the leak definition concentration is 500 parts per million by volume (ppmv).

Two (2) gas mixtures are required for instrument calibration and performance evaluation:

1. Zero Gas. Air, less than 10 ppmv VOC. Outdoor ambient air shall not be substituted in place of zero air gas.

2. Calibration Gas. The calibration gas must be methane, diluted to a nominal concentration of 500 parts per million in air.

Each cylinder gas must be provided with a Certificate of Analysis. The Certificate of Analysis provides the analytical accuracy and the product expiration date. The Certificate of Analysis for all calibration gasesused for calibration of the instrument will be provided in the final report submitted each quarter.

CALIBRATION AND BACKGROUND READINGS

Below are the standard guidelines for calibrating and assessing the performance of the monitoring instrument. Calibration must be completed per the manufacturer's guidelines and Method 21. In the event of a conflict between Method 21 and the manufacturer's guidelines, Riverbend must comply with Method 21 requirements. The technician should ensure that a copy of the operating manual is available to reference.

The calibration procedures below must be completed each day of sampling, prior to beginning monitoring. A separate calibration form (Attachment B) must be completed for each day of sampling including rechecks.

STANDARD CALIBRATION PROCEDURES

STEP 1: ASSEMBLE INSTRUMENT, POWER ON AND WARM UP

Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments. Check all filters and the probe tip for any blockages. Visually check all tubing and wiring for any cracks or perforations. Ensure that the pump is running at the proper flow rate. Ensure that the instrument has been fully charged and has a sufficient supply of fuel (i.e., hydrogen).

While the instrument is warming up, the technician should provide the meteorological conditions during the day of the monitoring on page 2 of the calibration forms shown in Attachment B.

STEP 2: RESPONSE FACTOR

The response factor for methane must be determined for the instrument that is being utilized in the monitoring.[3] The technician should consult the manufacturer specifications or operating manual for this information. If necessary, the response factor should be input into the instrument prior to calibrating the instrument. If a response factor is not specified by the manufacturer, then the response factor determination specified in section 8.1.1.1 of Method 21 will need to be conducted prior to placing the unit into service. The technician should note that the use of a portable analyzer that has a response factor of greater than 10 for methane is not allowed under Method 21. Methane typically has a response factor of 1.0 for most flame ionization detector (FID) models.

STEP 3: CALIBRATION OF INSTRUMENT (EACH TIME BEFORE USE)

After the appropriate warm-up period, navigate to the instrument calibration menu to begin the calibration procedure. Introduce the zero-air gas into the instrument sample probe by one of two methods: 1) Connect probe to cylinder regulator via tubing; or, 2) Connect probe to Tedlar bag via tubing. Allow the meter reading to stabilize (or adjust the meter readout to correspond to the zero-air gas value) prior to accepting the zero internal calibration result.

Next, introduce the 500 ppmv calibration gas into the instrument sample probe by one of two methods: 1) Connect probe to cylinder regulator via tubing; or, 2) Connect probe to Tedlar bag via tubing. Allow the meter reading to stabilize (or adjust the meter readout to correspond to the calibration gas value) prior to accepting the calibration gas result. After calibration is complete, the technician should place the instrument into “run mode” and conduct a quick check of the instrument by re-introducing the calibration gas and recording the steady reading on page 2 of the calibration sheets shown in Attachment B.

The technician should also record the lot numbers of both calibration gases along with the corresponding expiration dates on page 1 of the calibration sheets shown in Attachment B.

STEP 4: CALIBRATION PRECISION (EVERY 3 MONTHS)

The calibration precision test must be completed prior to commencement of monitoring activities.

Make a total of three (3) trial measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage. The calibration precision can be calculated using this formula:

$$\text{Precision} = \frac{[|T_1| - C_{span}] + [|T_2 - C_{span}|] + [|CT_3 - span|]}{3} \times \frac{1}{C_{span}} \times \frac{100}{1}$$

Where,

C_{span} = Concentration of calibration gas (ppm_v)

T_1, T_2, and T_3 = Actual meter reading (ppm_v) for Trials 1, 2 and 3 respectively

The calibration precision shall be equal to or less than 10 percent of the calibration gas value. All meter readings should be entered on page 1 of the calibration sheets shown in Attachment B.

STEP 5: RESPONSE TIME (ONCE BEFORE NEW COMMISSIONING)

The response time test is required before commencement of monitoring activities. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

- Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading using a stopwatch (or other method). Perform this test sequence three (3) times and record the results. Calculate the average response time.

The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe (with straight extension or attached to a wheel), and probe filter that will be used during testing shall all be in place during the response time determination. All readings should be entered on page 1 of the calibration sheets shown in Attachment B.

STEP 6: UPWIND/DOWNWIND READINGS (BEFORE EACH USE)

To complete the calibration procedure, upwind and downwind readings must be taken. These readings will be used as the baseline in determining exceedances on the monitoring path.

1. Confirm the landfill waste boundary with the Area Air Program Specialist or Site Operations.
2. Determine the wind direction. This will vary day to day, sometimes hour to hour.
3. Go to the upwind location to take the Upwind Reading outside the waste boundary of the landfill at a distance of at least 30 meters (98 feet) from the edge of waste. Record the reading on page 2 of the calibration forms provided in Attachment B.
4. Then go to the downwind location to take the Downwind Reading outside the waste boundary of the landfill at a distance of at least 30 meters (98 feet) from the edge of waste. Record the reading on page 2 of the calibration forms provided in Attachment B.

If an area more than 30 meters (98 feet) outside the edge of waste is not accessible, review proper location with Area Air Program Specialist for the landfill location. (The regulation specifies that the background readings shall be taken 30 meters (98 feet) outside of perimeter wells; however, care must be taken since toe drains could be present)

The average of the upwind reading and the downwind reading will be considered the background concentration. The NSPS/NESHAP exceedance limit is expressed as 500 ppmv above background levels. For example, if the background concentration is 5.0 ppmv, then the meter readout threshold for a surface monitoring exceedance is 505 ppmv (not 500 ppmv).

The initial calibration procedures are now complete, and sampling of the monitoring route can begin. Follow the procedures set forth below in the "Monitoring Procedures" section of this Protocol.

SCHEDULING OF MONITORING EVENT

SEM Events are coordinated with the Area Air Program Specialist, District Operations Manager/Supervisor, as well as the site LFG Technician and/or Area Gas Operations Manager. Site operations will prepare the landfill for the monitoring event (i.e., have the site mowed, etc.), if necessary. Site vegetation should be at a reasonable height so that monitoring path can be followed, and the monitoring probe can be properly positioned within 2 to 4 inches from the surface.

SEM Events are to be conducted during typical meteorological conditions.

MONITORING PROCEDURES

SURFACE EMISSIONS MONITORING

Riverbend Landfill conducts penetration monitoring as a separate event using the site specific penetration map (see Penetration Monitoring section).

The general procedures for surface emissions monitoring performed by third-party consultants include the following.

1. SEM technicians must be trained (see SEM Training section).
2. Third party technicians must check in at the landfill office and with the site LFG technician.
3. Personal Protective Equipment (PPE) is required while working outside of the office. PPE complement is as follows: high visibility clothing or vest, three gas personal monitor, hardhat, safety glasses, puncture resistant steel toed work boots.
4. Monitoring must be performed during typical meteorological conditions and include the meteorological data in the event report.
5. Prepare the instrument for use by conducting all the Calibration Procedures listed above.
6. Using the Surface Emissions Route Map, begin monitoring, by taking a reading at the starting location and begin the geospatial and temporal GPS log of the actual monitoring path.
7. Walk the route as delineated on the Surface Emissions Route Map while continuing to observe the meter readout and keeping the probe inlet at a height of 2 to 4 inches above the landfill surface.
8. Section 8.3.1 of Method 21 states: "If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for two times the instrument response time."
9. If visual observations by the technician along the surface route indicate signs of elevated

concentrations of LFG, such as distressed vegetation, cracks, seeps, or significant odor, the technician will deviate from the route to take a reading at that location. Once the area that has been visually identified has been measured, the technician must immediately return to the monitoring route and continue monitoring.

10. After completion of each monitoring day, meet to review events of the day, download monitoring data and assist in preparing the exceedance log (Attachment C).

PENETRATION MONITORING

Riverbend Landfill is subject to 40 CFR §60.763(d) of Subpart XXX and 40 CFR §63.1958(d) of the NESHAP AAAA, which require the monitoringof all cover penetrations and openings.

NESHAP AAAA includes a definition of cover penetration and for purposes of conducting SEM, Riverbend Landfill will use the following definition:

Cover penetration *means a wellhead, a part of a landfill gas collection, leachate system or operations system, and/or any other object that completely passes through the landfill cover. The landfill cover includes that portion which covers the waste, as well as the portion which borders the waste extended to the point where it is sealed with the landfill liner or the surrounding land mass. Examples of what is not a penetration for purposes of this subpart include but are not limited to:Survey stakes, fencing including litter fences, flags, signs, utility posts, and trees so long as theseitems do not pass through the landfill cover.*

For the monitoring requirement requiring the monitoring of "any openings", Riverbend Landfill defines "openings" to mean any cover penetration as defined above, and any area where waste has been placed that visually exhibits distressed vegetation and cracks and seeps inthe cover.

For actual penetration monitoring, the penetration will be monitored 2 to 4 inches above ground level. Monitoring will be done around the circumference at the base of each penetration location, as well as at areas of distressed vegetation and cracks and seeps. Any exceedance detected at a penetration will be labeled as a single penetration exceedance on the corresponding well number.

MONITORED EXCEEDANCE LOCATIONS

As discussed in 40 CFR §60.765(c)(4) and 40 CFR §63.1960(c)(4), any reading of 500 parts per million by volume (ppmv) or more above the background concentration at any location shall be recorded as a monitored exceedance.

If the technician monitors a location and the reading exceeds 500 ppmv, the location must be marked in the field and documented. The following procedure is to be completed at each monitored exceedance location.

1. Label brightly colored pin flags with a unique ID. Use several pin flags to denote the entire area of the exceedance. For Sites subject to 40 CFR 60, Subpart XXX and 40 CFR 63 Subpart AAAA, the exceedance location should be recorded using a GPS locator that is accurate to at least 4 meters (latitude and longitude coordinates must contain five decimal places).
2. Technician will record the flag number and the GPS coordinates on the field log.
3. Technician will note on the route map and field log the location of the exceedance including the label ID and the concentration recorded at that point.
4. Upon completion of each day's monitoring events, provide the monitored exceedances, monitoring data, their concentrations,
5. If repairs have been completed at an exceedance location during the same monitoring event, the technician will return to the repaired location(s) and conduct the 10-day follow-up monitoring event.
6. Ensure instrument is re-calibrated for each new day of follow-up monitoring.

Consult the USEPA flow chart at the beginning of this document and follow the steps in the next section for all monitoring exceedance locations.

EXCEEDANCE REPAIR PROCEDURES

Cover maintenance or adjustments to the GCCS will be made and the location will be re-monitored within 10 calendar days of the initial exceedance. The following will be completed for all surface, penetration, exceedances.

1. Exceedance Log will be updated that includes the following;
    - Date, Time, Exceedance ID, Description, GPS Location, Corrective Actions and Follow-Up Monitoring (10-day, 1-month, etc.)

A proposed corrective action plan and corresponding timeline will be submitted to the Administrator for approval for any location where monitored methane concentration equals or exceeds 500 ppmv above background three times within a quarterly period, except for when the exceedance will be corrected within 120-days by the addition of a new well or collection device.

MONITORED EXCEEDANCE RECHECKS

As required by 40 CFR §60.765(c)(4) and 40 CFR §63.1960(c)(4), any reading of 500 ppmv or more above the background concentration shall be recorded as a monitoredexceedance and specified corrective actions shall be taken. These regulations require that the monitored exceedance locations be re-monitored within ten (10) days and one (1) month of detecting the exceedance. Each re-monitoring event is detailed below. Also note that if the specified actions are taken, the exceedance is not a violation of the operational requirements of 40 CFR §60.763(d) or 40 CFR §63.1958(d).

The Area Air Program Specialist will develop a calendar for the re-monitoring events based on the date monitored. Reasonable efforts will be made to correct any monitored exceedance locations on the same day as the initial monitoring event. Riverbend Landfill or its contractors will complete corrective action measures that include and are not limited to cover repairs; or adjustments to the landfill gas collection and control system at each monitored exceedance location. Adjustments to the LFG system include and are not limited to increasing the vacuum of adjacent wells to increase the gas collection in the vicinity; fixing leaks; replacing bolts; installing boots; upgrading the blower, header pipes, or control device; etc. Root cause analysis as required by 40 CFR § 60.765 will be conducted for positive pressure and wellhead temperature exceedances.

10-Day RE-MONITORING

The locations of monitored exceedances are to be re-monitored within 10 calendar days of detecting the exceedance. All calibration procedures must be completed for each 10-day re-monitoring event.

- PASS: If the 10-day re-monitoring event shows methane concentrations at the monitored exceedance locations to be less than 500 ppm_v above the background, then the monitored exceedance locations are to be re-monitored one (1) month from the initial exceedance.

- FAIL: If the 10-day re-monitoring shows methane concentrations at the monitored exceedance locations to be greater than 500 ppmv above the background, then a second monitored exceedance has occurred. A second monitored exceedance requires additional corrective action be taken to remedy the exceedance. Corrective action measures include and are not limited to additional cover maintenance, additional adjustments to the LFG system.

  After completion of the additional corrective action, the second monitored exceedance location must be monitored within 10-days of the date of the second monitored exceedance. See Exceedance Repair Procedures for required documentation

  - PASS: If the 10-day re-monitoring for the second monitored exceedance location shows a methane concentration less than 500 ppmv above the background, then the second monitored exceedance must be re-monitored one (1) month from the initial exceedance. This location must then pass the 1-month follow-up to avoid three exceedances within the same quarter, which would prompt the 120-day corrective action period described in 40 CFR §60.765(c)(4)(v) and 40 CFR §63.1960(c)(4)(v). 10-day passing result will be entered into the exceedance log.

- FAIL: If the 10-day re-monitoring for the second monitored exceedance location shows a methane concentration greater than 500 ppmv above the background, then a new well or other collection device shall be installed at that location within 120 calendar days of the initial exceedance. (Note that an alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval if the exceedance is not corrected). No further monitoring is required at that exceedance location until the new well or other collection device has been installed. Second exceedance result will be entered into the exceedance log.

1-MONTH RE-MONITORING

The locations of monitored exceedances are to be re-monitored within 1 month of detecting the initial exceedance. All calibration procedures must be completed for each 1-month re-monitoring event.

- PASS: If the 1-month re-monitoring shows methane concentrations at the monitored exceedance locations to be less than 500 ppmv above the background, then no further monitoring of that monitored exceedance location is required until the next quarterly monitoring period. Results will be entered into the exceedance log.

- FAIL: If the 1-month re-monitoring shows methane concentrations at the monitored exceedance locations to be greater than 500 ppmv above the background and a second monitored exceedance has occurred,[6] the location requires additional corrective action to remedy the exceedance. Corrective action measures may include and are not limited to additional cover maintenance, additional adjustments to the LFG system, etc. After completionof the additional corrective action, the second monitored exceedance location is to be monitored within 10-days of the date of the second monitored exceedance.

    - PASS; If the 1-month re-monitoring for the second monitored exceedance location shows a methane concentration less than 500 ppmv above the background, then no further monitoring of that monitored exceedance location is required until the next quarterly monitoring period.
    - FAIL; If the 1-month re-monitoring for the second monitored exceedance location shows a methane concentration greater than 500 ppmv above the background, then a new well or other collection device shall be installed at that location within 120 calendar days of the initial exceedance. (Note that an alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval). No further monitoring is required at that exceedance location until the new well or other collection device has been installed.

The results of the follow-up monitoring will be documented on the exceedance log.

If an initial exceedance location fails the 10-day follow-up, passes the 20-day follow-up and fails the 1-month follow-up, this would constitute 3 exceedances within the same quarter, prompting the 120-day corrective action period described in 40 CFR 60.765(c)(4)(v).

Riverbend Landfill reports results of the 1st and 2nd quarter SEM events in the Semi-Annual Title V report and the 3rd and 4th quarters SEM Events in the Annual Title V reports. The Semi-Annual and Annual Title V reports are sent to Oregon Department of Environmental Quality and during the year after the effective date of the Administrative Compliance Order on Consent, Docket Number CAA-10-2021-0055, individual quarterly SEM event reports must be sent to EPA Region 10 60 days after the last monitored exceedance date. The SEM Report includes the following components:

COVER LETTER

The cover letter includes text explaining when the monitoring was completed, what equipment was used to complete the monitoring, what regulations were followed while completing the monitoring, corrective actions taken on any monitored exceedances, as well as the results from the monitoring. The following information outlined below should be included with the cover letter.

FIGURE 1 SITE PLAN

An overall site map depicting the approved SEM monitoring path imposed on the site map, exceedance locations includinglabel IDs, and upwind/downwind locations. This map also delineates the dangerous areas that were excluded from the monitoring.

TABLE 1 – SURFACE/PENETRATION/ MONITORING EXCEEDANCES AND CORRECTIVE ACTIONS

Table 1 contains a summary of the exceedances detected during the initial scan and any re-monitoring events conducted at the site as part of the monitoring event. Also included is a summary of corrective actions implemented at each location.

- All locations measured at or above 500 ppmv above background during the initial monitoring event must be included in this table. Concentrations must be reported as numerical values for monitoring points that are 500 ppmv above background or greater.
- An "NA" is placed in any Cell that does not apply or the cell is greyed out.
- If there are no exceedances detected for a quarterly SEM event, then Table 1 can be omitted from the report.

ATTACHMENT 1 – CALIBRATION RECORDS

Attachment 1 of the SEM report provides all the calibration forms for each daily monitoring event (this includes the initial monitoring event and all follow-up events).

ATTACHMENT 2 – CALIBRATION GASES CERTIFICATES OF ANALYSIS

Attachment 2 of the report consists of copies of the certificates of analysis for the calibration gases used to complete the initial monitoring and any associated rechecks.

ATTACHMENT A

SURFACE EMISSIONS MONITORING REFERENCE STANDARDS

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. To see a complete version including any recent edits, visit: https://www.ecfr.gov/cgi-bin/ECFR?page=browse and search under Title 40, Protection of Environment.

METHOD 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1.0 Scope and Application

1.1 Analytes.

Analyte	CAS No.
Volatile Organic Compounds (VOC)	No CAS number assigned.

1.2 Scope. This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 6.0. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

3.0 Definitions

3.1 *Calibration gas* means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

3.2 *Calibration precision* means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

3.3 *Leak definition concentration* means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

3.4 *No detectable emission* means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentration, that is less than 2.5 percent of the specified leak definition concentration. that indicates that a VOC emission (leak) is not present.

3.5 *Reference compound* means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.)

3.6 *Response factor* means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

3.7 *Response time* means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Pollutants. Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (*e.g.,* heptane) or may be toxic (*e.g.,* benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions can be found in reference documents, such as reference No. 4 in Section 16.0.

6.0 Equipment and Supplies

A VOC monitoring instrument meeting the following specifications is required:

6.1 The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

6.2 The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

6.3 The scale of the instrument meter shall be readable to ±2.5 percent of the specified leak definition concentration.

6.4 The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft^3 /min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

6.5 The instrument shall be equipped with a probe or probe extension or sampling not to exceed 6.4 mm (1/4in) in outside diameter, with a single end opening for admission of sample.

6.6 The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

7.0 Reagents and Standards

7.1 Two gas mixtures are required for instrument calibration and performance evaluation:

7.1.1 Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.

7.1.2 Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

7.2 Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

7.3 Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2 percent. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

7.4 Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Instrument Performance Evaluation. Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments.

8.1.1 Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

8.1.1.1 Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

8.1.1.2 The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

8.1.1.3 Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in References 1–3 of Section 17.0.

8.1.2 Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

8.1.2.1 Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

8.1.2.2 The calibration precision shall be equal to or less than 10 percent of the calibration gas value.

8.1.3 Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

8.1.3.1 Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

8.1.3.2 The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

8.2 Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

8.3 Individual Source Surveys.

8.3.1 Type I—Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

8.3.1.1 Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

8.3.1.2 Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

8.3.1.3 Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

8.3.1.4 Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

8.3.1.5 Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

8.3.1.6 Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.7 Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.8 Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

8.3.2 Type II—"No Detectable Emission". Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined in Section 8.3.1. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

8.3.2.1 Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described in Section 8.3.2.

8.3.2.2 Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices. If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described in Section 8.3.2 shall be used to determine if detectable emissions exist.

8.3.3 Alternative Screening Procedure.

8.3.3.1 A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of Section 8.3.1 or 8.3.2.

8.3.3.2 Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques of Section 8.3.1 or 8.3.2 shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

9.0 Quality Control

Section	**Quality control measure**	**Effect**
8.1.2	Instrument calibration precision check	Ensure precision and accuracy, respectively, of instrument response to standard.
10.0	Instrument calibration	

10.0 Calibration and Standardization

10.1 Calibrate the VOC monitoring instrument as follows. After the appropriate warm-up period and zero internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value.

Note: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.

11.0 Analytical Procedures[Reserved]

12.0 Data Analyses and Calculations[Reserved]

13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

1. Dubose, D.A., and G.E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81051. September 1981.

2. Brown, G.E., *et al.* Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–022. May 1981.

3. DuBose, D.A. *et al.* Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–110. September 1981.

4. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data[Reserved]

(b) After the installation of a collection and control system in compliance with § 60.755, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in § 60.752(b)(2)(v), using the following equation:

$M_{NMOC} = 1.89 \times 10^{-3} Q_{LFG} C_{NMOC}$

where,

M_{NMOC} = mass emission rate of NMOC, megagrams per year

Q_{LFG} = flow rate of landfill gas, cubic meters per minute

C_{NMOC} = NMOC concentration, parts per million by volume as hexane

(1) The flow rate of landfill gas, Q_{LFG}, shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of section 4 of Method 2E of appendix A of this part.

(2) The average NMOC concentration, C_{NMOC}, shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18 of appendix A of this part. If using Method 18 of appendix A of this part, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C of appendix A of this part by six to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the Administrator.

(c) When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this subpart shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in §§ 51.166 or 52.21 of this chapter using AP-42 or other approved measurement procedures.

(d) For the performance test required in § 60.752(b)(2)(iii)(B), Method 25, 25C, or Method 18 of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 60.752(b)(2)(i)(B). Method 3 or 3A shall be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. If using Method 18 of appendix A of this part, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The following equation shall be used to calculate efficiency:

Control Efficiency = $(NMOC_{in} - NMOC_{out})/(NMOC_{in})$

where,

$NMOC_{in}$ = mass of NMOC entering control device

$NMOC_{out}$ = mass of NMOC exiting control device

(e) For the performance test required in § 60.752(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 60.18(f)(4).

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32751, June 16, 1998; 65 FR 18908, Apr. 10, 2000; 65 FR 61778, Oct. 17, 2000; 71 FR 55127, Sept. 21, 2006]

§ 60.755 Compliance provisions.

(a) Except as provided in § 60.752(b)(2)(i)(B), the specified methods in paragraphs (a)(1) through (a)(6) of this section shall be used to determine whether the gas collection system is in compliance with § 60.752(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 60.752(b)(2)(ii)(A)(*1*), one of the following equations shall be used. The k and L_o kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 60.754(a)(4), the value of k determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

$$Q_m = 2L_o R (e^{-kc} - e^{-kt})$$

where,

Q_m = maximum expected gas generation flow rate, cubic meters per year

L_o = methane generation potential, cubic meters per megagram solid waste

R = average annual acceptance rate, megagrams per year

k = methane generation rate constant, $year^{-1}$

t = age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years

c = time since closure, years (for an active landfill c = O and e^{-kc} = 1)

(ii) For sites with known year-to-year solid waste acceptance rate:

where,

Q_M = maximum expected gas generation flow rate, cubic meters per year

k = methane generation rate constant, $year^{-1}$

L_o = methane generation potential, cubic meters per megagram solid waste

M_i = mass of solid waste in the i^{th} section, megagrams

t_i = age of the i^{th} section, years

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in paragraphs (a)(1) (i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using the equations in paragraphs (a)(1) (i) or (ii) or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 60.752(b)(2)(ii)(A)(*2*), the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 60.752(b)(2)(ii)(A)(*3*), the owner or operator shall measure gauge pressure in the gas collection header at each individual well, monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within

5 calendar days, except for the three conditions allowed under § 60.753(b). If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.

(4) Owners or operators are not required to expand the system as required in paragraph (a)(3) of this section during the first 180 days after gas collection system startup.

(5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in § 60.753(c). If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.

(6) An owner or operator seeking to demonstrate compliance with § 60.752(b)(2)(ii)(A)(*4*) through the use of a collection system not conforming to the specifications provided in § 60.759 shall provide information satisfactory to the Administrator as specified in § 60.752(b)(2)(i)(C) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 60.753(a), each owner or operator of a controlled landfill shall place each well or design component as specified in the approved design plan as provided in § 60.752(b)(2)(i). Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade.

(c) The following procedures shall be used for compliance with the surface methane operational standard as provided in § 60.753(d).

(1) After installation of the collection system, the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring shall be performed in accordance with section 4.3.1 of Method 21 of appendix A of this part, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4) (i) through (v) of this section shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 60.753(d).

(i) The location of each monitored exceedance shall be marked and the location recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance shall be made and the location shall be re-monitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section shall be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4) (ii) or (iii) of this section shall be re-monitored 1 month from the initial exceedance. If the 1-month remonitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month remonitoring shows an exceedance, the actions specified in paragraph (c)(4) (iii) or (v) shall be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section shall comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer shall meet the instrument specifications provided in section 3 of Method 21 of appendix A of this part, except that “methane” shall replace all references to VOC.

(2) The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 3.1.3 of Method 21 of appendix A of this part, the instrument evaluation procedures of section 4.4 of Method 21 of appendix A of this part shall be used.

(4) The calibration procedures provided in section 4.2 of Method 21 of appendix A of this part shall be followed immediately before commencing a surface monitoring survey.

(e) The provisions of this subpart apply at all times, except during periods of start-up, shutdown, or malfunction, provided that the duration of start-up, shutdown, or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices.

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32752, June 16, 1998]

§ 60.756 Monitoring of operations.

Except as provided in § 60.752(b)(2)(i)(B),

(a) Each owner or operator seeking to comply with § 60.752(b)(2)(ii)(A) for an active gas collection system shall install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 60.755(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as provided in § 60.755(a)(5); and

(3) Monitor temperature of the landfill gas on a monthly basis as provided in § 60.755(a)(5).

(b) Each owner or operator seeking to comply with § 60.752(b)(2)(iii) using an enclosed combustor shall calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment.

(1) A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of ±1 percent of the temperature being measured expressed in degrees Celsius or ±0.5 degrees Celsius, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity equal to or greater than 44 megawatts.

(2) A device that records flow to or bypass of the control device. The owner or operator shall either:

(i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(c) Each owner or operator seeking to comply with § 60.752(b)(2)(iii) using an open flare shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame.

(2) A device that records flow to or bypass of the flare. The owner or operator shall either:

of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (AP-42) or other approved measurement procedures.

(d) For the performance test required in § 60.762(b)(2)(iii)(B), Method 25 or 25C (Method 25C may be used at the inlet only) of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20 parts per million by volume outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 60.767(c)(2). Method 3, 3A, or 3C must be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. Method 18 may be used in conjunction with Method 25A on a limited basis (compound specific, *e.g.,* methane) or Method 3C may be used to determine methane. The methane as carbon should be subtracted from the Method 25A total hydrocarbon value as carbon to give NMOC concentration as carbon. The landowner or operator must divide the NMOC concentration as carbon by 6 to convert from the CNMOC as carbon to CNMOC as hexane. Equation 4 must be used to calculate efficiency:

Where:

$NMOC_{in}$ = Mass of NMOC entering control device.

$NMOC_{out}$ = Mass of NMOC exiting control device.

(e) For the performance test required in § 60.762(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 60.18(f)(4).

(1) Within 60 days after the date of completing each performance test (as defined in § 60.8), the owner or operator must submit the results of the performance tests, including any associated fuel analyses, required by § 60.764(b) or (d) according to § 60.767(i)(1).

(2) [Reserved]

§ 60.765 Compliance provisions.

(a) Except as provided in § 60.767(c)(2), the specified methods in paragraphs (a)(1) through (6) of this section must be used to determine whether the gas collection system is in compliance with § 60.762(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 60.762(b)(2)(ii)(C)(*1*), either Equation 5 or Equation 6 must be used. The methane generation rate constant (k) and methane generation potential (L_o) kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 60.764(a)(4), the value of k determined from the test must be used. A value of no more than 15 years must be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

Where:

Q_m = Maximum expected gas generation flow rate, cubic meters per year.

L_o = Methane generation potential, cubic meters per megagram solid waste.

R = Average annual acceptance rate, megagrams per year.

k = Methane generation rate constant, $year^{-1}$.

t = Age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years.

c = Time since closure, years (for an active landfill c = 0 and $e^{-kc} = 1$).

(ii) For sites with known year-to-year solid waste acceptance rate:

Where:

Q_M = Maximum expected gas generation flow rate, cubic meters per year.

k = Methane generation rate constant, $year^{-1}$.

L_o = Methane generation potential, cubic meters per megagram solid waste.

M_i = Mass of solid waste in the i^{th} section, megagrams.

t_i = Age of the i^{th} section, years.

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, Equation 5 or Equation 6 in paragraphs (a)(1)(i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using Equation 5 or Equation 6 in paragraphs (a)(1)(i) or (ii) of this section or other methods must be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 60.762(b)(2)(ii)(C)(2), the owner or operator must design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 60.762(b)(2)(ii)(C)(*3*), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well, monthly. If a positive pressure exists, action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under § 60.763(b). Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(i) If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to § 60.768(e)(3).

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in § 60.767(g)(7) as part of the next annual report. The owner or operator must keep records according to § 60.768(e)(4).

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 60.767(g)(7) and § 60.767(j). The owner or operator must keep records according to § 60.768(e)(5).

(4) [Reserved]

(5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must monitor each well monthly for temperature as provided in § 60.763(c). If a well exceeds the operating parameter for temperature, action must be initiated to correct the exceedance within 5 calendar days. Any attempted corrective

measure must not cause exceedances of other operational or performance standards.

(i) If a landfill gas temperature less than 55 degrees Celsius (131 degrees Fahrenheit) cannot be achieved within 15 calendar days of the first measurement of landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit) was first measured. The owner or operator must keep records according to § 60.768(e)(3).

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure or elevated temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 55 degrees Celsius (131 degrees Fahrenheit) or positive pressure. The owner or operator must submit the items listed in § 60.767(g)(7) as part of the next annual report. The owner or operator must keep records according to § 60.768(e)(4).

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 60.767(g)(7) and § 60.767(j). The owner or operator must keep records according to § 60.768(e)(5).

(6) An owner or operator seeking to demonstrate compliance with § 60.762(b)(2)(ii)(C)(*4*) through the use of a collection system not conforming to the specifications provided in § 60.769 must provide information satisfactory to the Administrator as specified in § 60.767(c)(3) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 60.763(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in § 60.767(c). Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) Five (5) years or more if active; or

(2) Two (2) years or more if closed or at final grade.

(c) The following procedures must be used for compliance with the surface methane operational standard as provided in § 60.763(d).

(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of Method 21 of appendix A of this part, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 60.763(d).

(i) The location of each monitored exceedance must be marked and the location and concentration recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be re-monitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device must be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section or § 60.764(a)(6) must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer must meet the instrument specifications provided in section 6 of Method 21 of appendix A of this part, except that “methane” replaces all references to “VOC”.

(2) The calibration gas must be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 8.1 of Method 21 of appendix A of this part, the instrument evaluation procedures of section 8.1 of Method 21 of appendix A of this part must be used.

(4) The calibration procedures provided in sections 8 and 10 of Method 21 of appendix A of this part must be followed immediately before commencing a surface monitoring survey.

(e) The provisions of this subpart apply at all times, including periods of startup, shutdown or malfunction. During periods of startup, shutdown, and malfunction, you must comply with the work practice specified in § 60.763(e) in lieu of the compliance provisions in § 60.765.

[81 FR 59368, Aug. 29, 2016, as amended at 85 FR 17261, Mar. 26, 2020]

§ 60.766 Monitoring of operations.

Except as provided in § 60.767(c)(2):

(a) Each owner or operator seeking to comply with § 60.762(b)(2)(ii)(C) for an active gas collection system must install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 60.765(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as follows:

(i) The nitrogen level must be determined using Method 3C, unless an alternative test method is established as allowed by § 60.767(c)(2).

(ii) Unless an alternative test method is established as allowed by § 60.767(c)(2), the oxygen level must be determined by an oxygen meter using Method 3A, 3C, or ASTM D6522-11 (incorporated by reference, see § 60.17). Determine the oxygen level by an oxygen meter using Method 3A, 3C, or ASTM D6522-11 (if sample location is prior to combustion) except that:

(A) The span must be set between 10 and 12 percent oxygen;

(B) A data recorder is not required;

(C) Only two calibration gases are required, a zero and span;

(D) A calibration error check is not required;

(E) The allowable sample bias, zero drift, and calibration drift are ±10 percent.

(iii) A portable gas composition analyzer may be used to monitor the oxygen levels provided:

Deviations for continuous emission monitors or numerical continuous parameter monitors must be determined using a 3-hour monitoring block average. Beginning no later than September 28, 2021, the collection and control system design plan may include for approval collection and control systems that include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping, or reporting provisions, as provided in § 63.1981(d)(2).

(b) If you own or operate a bioreactor that is located at an MSW landfill that is not permanently closed and has a design capacity equal to or greater than 2.5 million Mg and 2.5 million m^3, then you must meet the requirements of this subpart, including requirements in paragraphs (b)(1) and (2) of this section.

(1) You must comply with this subpart starting on the date you are required to install the gas collection and control system.

(2) You must extend the collection and control system into each new cell or area of the bioreactor prior to initiating liquids addition in that area.

(c) At all times, beginning no later than September 27, 2021, the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require the owner or operator to make any further efforts to reduce emissions if the requirements of this subpart have been achieved. Determination of whether a source is operating in compliance with operation and maintenance requirements will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

§ 63.1957 Requirements for gas collection and control system installation and removal.

(a) ***Operation.*** Operate the collection and control device in accordance with the provisions of §§ 63.1958, 63.1960, and 63.1961.

(b) ***Removal criteria.*** The collection and control system may be capped, removed, or decommissioned if the following criteria are met:

(1) The landfill is a closed landfill (as defined in § 63.1990). A closure report must be submitted to the Administrator as provided in § 63.1981(f);

(2) The gas collection and control system has been in operation a minimum of 15 years or the landfill owner or operator demonstrates that the gas collection and control system will be unable to operate for 15 years due to declining gas flow; and

(3) Following the procedures specified in § 63.1959(c), the calculated NMOC emission rate at the landfill is less than 50 Mg/yr on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart.

§ 63.1958 Operational standards for collection and control systems.

Each owner or operator of an MSW landfill with a gas collection and control system used to comply with the provisions of § 63.1957 must:

(a) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade;

(b) Operate the collection system with negative pressure at each wellhead except under the following conditions:

(1) A fire or increased well temperature. The owner or operator must record instances when positive pressure occurs in efforts to avoid a fire. These records must be submitted with the semi-annual reports as provided in § 63.1981(h);

(2) Use of a geomembrane or synthetic cover. The owner or operator must develop acceptable pressure limits in the design plan;

(3) A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes must be approved by the Administrator as specified in § 63.1981(d)(2);

(c) Operate each interior wellhead in the collection system as specified in 40 CFR 60.753(c), until the landfill owner or operator elects to meet the operational standard for temperature in paragraph (c)(1) of this section.

(1) Beginning no later than September 27, 2021, operate each interior wellhead in the collection system with a landfill gas temperature less than 62.8 degrees Celsius (145 degrees Fahrenheit).

(2) The owner or operator may establish a higher operating temperature value at a particular well. A higher operating value demonstration must be submitted to the Administrator for approval and must include supporting data demonstrating that the elevated parameter neither causes fires nor significantly inhibits anaerobic decomposition by killing methanogens. The demonstration must satisfy both criteria in order to be approved (*i.e.,* neither causing fires nor killing methanogens is acceptable).

(d)

(1) Operate the collection system so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan must be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.

(2) Beginning no later than September 27, 2021, the owner or operator must:

(i) Conduct surface testing using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in § 63.1960(d).

(ii) Conduct surface testing at all cover penetrations. Thus, the owner or operator must monitor any cover penetrations that are within an area of the landfill where waste has been placed and a gas collection system is required.

(iii) Determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.

(e) Operate the system as specified in § 60.753(e) of this chapter, except:

(1) Beginning no later than September 27, 2021, operate the system in accordance to § 63.1955(c) such that all collected gases are vented to a control system designed and operated in compliance with § 63.1959(b)(2)(iii). In the event the collection or control system is not operating:

(i) The gas mover system must be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere must be closed within 1 hour of the collection or control system not operating; and

(ii) Efforts to repair the collection or control system must be initiated and completed in a manner such that downtime is kept to a minimum, and the collection and control system must be returned to operation.

(2) [Reserved]

(f) Operate the control system at all times when the collected gas is routed to the system.

(g) If monitoring demonstrates that the operational requirements in paragraph (b), (c), or (d) of this section are not met, corrective action must be taken as specified in § 63.1960(a)(3) and (5) or (c). If corrective actions are taken as specified in § 63.1960, the monitored exceedance is not a deviation of the operational requirements in this section.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1959 NMOC calculation procedures.

(a) Calculate the NMOC emission rate using the procedures specified in § 60.754(a) of this chapter, except:

(1) ***NMOC emission rate.*** Beginning no later than September 27, 2021 the landfill owner or operator must calculate the NMOC emission rate using either Equation 1 provided in paragraph (a)(1)(i) of this section or Equation 2 provided in paragraph (a)(1)(ii) of this section. Both Equation 1 and Equation 2 may be used if the actual year-to-year solid waste acceptance rate is known, as specified in paragraph (a)(1)(i) of this section, for part of the life of the landfill and the actual year-to-year solid waste acceptance rate is unknown, as specified in paragraph (a)(1)(ii) of this

section, for part of the life of the landfill. The values to be used in both Equation 1 and Equation 2 are 0.05 per year for k, 170 cubic meters per megagram (m^3/Mg) for L_O, and 4,000 parts per million by volume (ppmv) as hexane for the C_{NMOC}. For landfills located in geographical areas with a 30-year annual average precipitation of less than 25 inches, as measured at the nearest representative official meteorologic site, the k value to be used is 0.02 per year.

(i)

(A) Equation 1 must be used if the actual year-to-year solid waste acceptance rate is known.

Where:

M_{NMOC} = Total NMOC emission rate from the landfill, Mg/yr.

k = Methane generation rate constant, year−1.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of solid waste in the ith section, Mg.

t_i = Age of the ith section, years.

C_{NMOC} = Concentration of NMOC, ppmv as hexane.

3.6 × 10−9 = Conversion factor.

(B) The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for M_i if documentation of the nature and amount of such wastes is maintained.

(ii)

(A) Equation 2 must be used if the actual year-to-year solid waste acceptance rate is unknown.

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.

L_o = Methane generation potential, m^3/Mg solid waste.

R = Average annual acceptance rate, Mg/yr.

k = Methane generation rate constant, $year^{-1}$.

t = Age of landfill, years.

C_{NMOC} = Concentration of NMOC, ppmv as hexane.

c = Time since closure, years; for active landfill c=0 and $e^{-kc} = 1$.

3.6×10^{-9} = Conversion factor.

(B) The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value of R, if documentation of the nature and amount of such wastes is maintained.

(2) ***Tier 1.*** The owner or operator must compare the calculated NMOC mass emission rate to the standard of 50 Mg/yr.

(i) If the NMOC emission rate calculated in paragraph (a)(1) of this section is less than 50 Mg/yr, then the landfill owner or operator must submit an NMOC emission rate report according to § 63.1981(c) and must recalculate the NMOC mass emission rate annually as required under paragraph (b) of this section.

(ii) If the calculated NMOC emission rate as calculated in paragraph (a)(1) of this section is equal to or greater than 50 Mg/yr, then the landfill owner must either:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months of the first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, according to paragraphs (b)(2)(ii) and (iii) of this section;

(B) Determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the Tier 2 procedures provided in paragraph (a)(3) of this section; or

(C) Determine a site-specific methane generation rate constant and recalculate the NMOC emission rate using the Tier 3 procedures provided in paragraph (a)(4) of this section.

(3) ***Tier 2.*** The landfill owner or operator must determine the site-specific NMOC concentration using the following sampling procedure. The landfill owner or operator must install at least two sample probes per hectare, evenly distributed over the landfill surface that has retained waste for at least 2 years. If the landfill is larger than 25 hectares in area, only 50 samples are required. The probes should be evenly distributed across the sample area. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator must collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using EPA Method 25 or 25C of appendix A-7 to part 60. Taking composite samples from different probes into a single cylinder is allowed; however, equal sample volumes must be taken from each probe. For each composite, the sampling rate, collection times, beginning and ending cylinder vacuums, or alternative volume measurements must be recorded to verify that composite volumes are equal. Composite sample volumes should not be less than one liter unless evidence can be provided to substantiate the accuracy of smaller volumes. Terminate compositing before the cylinder approaches ambient pressure where measurement accuracy diminishes. If more than the required number of samples are taken, all samples must be used in the analysis. The landfill owner or operator must divide the NMOC concentration from EPA Method 25 or 25C of appendix A-7 to part 60 by 6 to convert from C_{NMOC} as carbon to C_{NMOC} as hexane. If the landfill has an active or passive gas removal system in place, EPA Method 25 or 25C samples may be collected from these systems instead of surface probes provided the removal system can be shown to provide sampling as representative as the two sampling probe per hectare requirement. For active collection systems, samples may be collected from the common header pipe. The sample location on the common header pipe must be before any gas moving, condensate removal, or treatment system equipment. For active collection systems, a minimum of three samples must be collected from the header pipe.

(i) Within 60 days after the date of completing each performance test (as defined in § 63.7 of subpart A), the owner or operator must submit the results according to § 63.1981(l)(1).

(ii) The landfill owner or operator must recalculate the NMOC mass emission rate using Equation 1 or Equation 2 provided in paragraph (a)(1)(i) or (ii) of this section and use the average site-specific NMOC concentration from the collected samples instead of the default value provided in paragraph (a)(1) of this section.

(iii) If the resulting NMOC mass emission rate is less than 50 Mg/yr, then the owner or operator must submit a periodic estimate of NMOC emissions in an NMOC emission rate report according to § 63.1981(c) and must recalculate the NMOC mass emission rate annually as required under paragraph (b) of this section. The site-specific NMOC concentration must be retested every 5 years using the methods specified in this section.

(iv) If the NMOC mass emission rate as calculated using the Tier 2 site-specific NMOC concentration is equal to or greater than 50 Mg/yr, the landfill owner or operator must either:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months according to paragraphs (b)(2)(ii) and (iii) of this section; or

(B) Determine a site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the Tier 3 procedures specified in paragraph (a)(4) of this section.

(4) ***Tier 3.*** The site-specific methane generation rate constant must be determined using the procedures provided in EPA Method 2E of appendix A-1 to part 60 of this chapter. The landfill owner or operator must estimate the NMOC mass emission rate using Equation 1 or Equation 2 in paragraph (a)(1)(i) or (ii) of this section and using a site-

specific methane generation rate constant, and the site-specific NMOC concentration as determined in paragraph (a)(3) of this section instead of the default values provided in paragraph (a)(1) of this section. The landfill owner or operator must compare the resulting NMOC mass emission rate to the standard of 50 Mg/yr.

(i) If the NMOC mass emission rate as calculated using the Tier 2 site-specific NMOC concentration and Tier 3 site-specific methane generation rate is equal to or greater than 50 Mg/yr, the owner or operator must:

(A) Submit a gas collection and control system design plan within 1 year as specified in § 63.1981(d) and install and operate a gas collection and control system within 30 months of the first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, according to paragraphs (b)(2)(ii) and (iii) of this section.

(B) [Reserved]

(ii) If the NMOC mass emission rate is less than 50 Mg/yr, then the owner or operator must recalculate the NMOC mass emission rate annually using Equation 1 or Equation 2 in paragraph (a)(1) of this section and using the site-specific Tier 2 NMOC concentration and Tier 3 methane generation rate constant and submit a periodic NMOC emission rate report as provided in § 63.1981(c). The calculation of the methane generation rate constant is performed only once, and the value obtained from this test must be used in all subsequent annual NMOC emission rate calculations.

(5) ***Other methods.*** The owner or operator may use other methods to determine the NMOC concentration or a site-specific methane generation rate constant as an alternative to the methods required in paragraphs (a)(3) and (4) of this section if the method has been approved by the Administrator.

(b) Each owner or operator of an affected source having a design capacity equal to or greater than 2.5 million Mg and 2.5 million m^3 must either comply with paragraph (b)(2) of this section or calculate an NMOC emission rate for the landfill using the procedures specified in paragraph (a) of this section. The NMOC emission rate must be recalculated annually, except as provided in § 63.1981(c)(1)(ii)(A).

(1) If the calculated NMOC emission rate is less than 50 Mg/yr, the owner or operator must:

(i) Submit an annual NMOC emission rate emission report to the Administrator, except as provided for in § 63.1981(c)(1)(ii); and

(ii) Recalculate the NMOC emission rate annually using the procedures specified in paragraph (a)(1) of this section until such time as the calculated NMOC emission rate is equal to or greater than 50 Mg/yr, or the landfill is closed.

(A) If the calculated NMOC emission rate, upon initial calculation or annual recalculation required in paragraph (b) of this section, is equal to or greater than 50 Mg/yr, the owner or operator must either: comply with paragraph (b)(2) of this section or calculate NMOC emissions using the next higher tier in paragraph (a) of this section.

(B) If the landfill is permanently closed, a closure report must be submitted to the Administrator as provided for in § 63.1981(f).

(2) If the calculated NMOC emission rate is equal to or greater than 50 Mg/yr using Tier 1, 2, or 3 procedures, the owner or operator must either:

(i) Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year as specified in § 63.1981(d) or calculate NMOC emissions using the next higher tier in paragraph (a) of this section. The collection and control system must meet the requirements in paragraphs (b)(2)(ii) and (iii) of this section.

(ii) Collection system. Install and start up a collection and control system that captures the gas generated within the landfill as required by paragraphs (b)(2)(ii)(B) or (C) and (b)(2)(iii) of this section within 30 months after:

(A) The first annual report in which the NMOC emission rate equals or exceeds 50 Mg/yr, unless Tier 2 or Tier 3 sampling demonstrates that the NMOC emission rate is less than 50 Mg.

(B) An active collection system must:

(*1*) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment;

(*2*) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade;

(*3*) Collect gas at a sufficient extraction rate; and

(*4*) Be designed to minimize off-site migration of subsurface gas.

(C) A passive collection system must:

(*1*) Comply with the provisions specified in paragraphs (b)(2)(ii)(B)(1), (2), and (3) of this section; and

(*2*) Be installed with liners on the bottom and all sides in all areas in which gas is to be collected. The liners must be installed as required under § 258.40 of this chapter.

(iii) Control system. Route all the collected gas to a control system that complies with the requirements in either paragraph (b)(2)(iii)(A), (B), or (C) of this section.

(A) A non-enclosed flare designed and operated in accordance with the parameters established in § 63.11(b) except as noted in paragraph (e) of this section; or

(B) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight-percent or reduce the outlet NMOC concentration to less than 20 ppmv, dry basis as hexane at 3-percent oxygen. The reduction efficiency or ppmv must be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the test methods specified in paragraph (e) of this section. The performance test is not required for boilers and process heaters with design heat input capacities equal to or greater than 44 megawatts that burn landfill gas for compliance with this subpart.

(*1*) If a boiler or process heater is used as the control device, the landfill gas stream must be introduced into the flame zone.

(*2*) The control device must be operated within the parameter ranges established during the initial or most recent performance test. The operating parameters to be monitored are specified in §§ 63.1961(b) through (e);

(C) A treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-British thermal unit (Btu) gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to either paragraph (b)(2)(iii)(A) or (B) of this section.

(D) All emissions from any atmospheric vent from the gas treatment system are subject to the requirements of paragraph (b)(2)(iii)(A) or (B) of this section. For purposes of this subpart, atmospheric vents located on the condensate storage tank are not part of the treatment system and are exempt from the requirements of paragraph (b)(2)(iii)(A) or (B) of this section.

(c) After the installation and startup of a collection and control system in compliance with this subpart, the owner or operator must calculate the NMOC emission rate for purposes of determining when the system can be capped, removed, or decommissioned as provided in § 63.1957(b)(3), using Equation 3:

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.

Q_{LFG} = Flow rate of landfill gas, m^3 per minute.

C_{NMOC} = Average NMOC concentration, ppmv as hexane.

1.89×10^{-3} = Conversion factor.

(1) The flow rate of landfill gas, Q_{LFG}, must be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control system using a gas flow measuring device calibrated according to the provisions of section 10 of EPA Method 2E of appendix A-1 of part 60.

(2) The average NMOC concentration, C_{NMOC}, must be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in EPA Method 25 or 25C of appendix A-7 to part 60 of this chapter. The sample location on the common header pipe must be before any condensate removal or other gas refining units. The landfill owner or operator must divide the NMOC concentration from EPA Method 25 or 25C of appendix A-7 to part 60 by 6 to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the Administrator.

(i) Within 60 days after the date of completing each performance test (as defined in § 63.7), the owner or operator must submit the results of the performance test, including any associated fuel analyses, according to § 63.1981(l)(1).

(ii) [Reserved]

(d) For the performance test required in § 63.1959(b)(2)(iii)(B), EPA Method 25 or 25C (EPA Method 25C of appendix A-7 to part 60 of this chapter may be used at the inlet only) of appendix A of this part must be used to determine compliance with the 98 weight-percent efficiency or the 20- ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 63.1981(d)(2). EPA Method 3, 3A, or 3C of appendix A-7 to part 60 must be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), EPA Method 25A should be used in place of EPA Method 25. EPA Method 18 may be used in conjunction with EPA Method 25A on a limited basis (compound specific, *e.g.,* methane) or EPA Method 3C may be used to determine methane. The methane as carbon should be subtracted from the EPA Method 25A total hydrocarbon value as carbon to give NMOC concentration as carbon. The landowner or operator must divide the NMOC concentration as carbon by 6 to convert from the C_{NMOC} as carbon to C_{NMOC} as hexane. Equation 4 must be used to calculate efficiency:

Where:

$NMOC_{in}$ = Mass of NMOC entering control device.

$NMOC_{out}$ = Mass of NMOC exiting control device.

(e) For the performance test required in § 63.1959(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in § 63.11(b)(6)(ii) is calculated from the concentration of methane in the landfill gas as measured by EPA Method 3C of appendix A to part 60 of this chapter. A minimum of three 30-minute EPA Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. EPA Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under § 63.11(b)(7) of subpart A.

(1) Within 60 days after the date of completing each performance test (as defined in § 63.7), the owner or operator must submit the results of the performance tests, including any associated fuel analyses, required by § 63.1959(c) or (e) according to § 63.1981(l)(1).

(2) [Reserved]

(f) The performance tests required in §§ 63.1959(b)(2)(iii)(A) and (B), must be conducted under such conditions as the Administrator specifies to the owner or operator based on representative performance of the affected source for the period being tested. Representative conditions exclude periods of startup and shutdown unless specified by the Administrator. The owner or operator may not conduct performance tests during periods of malfunction. The owner or operator must record the process information that is necessary to document operating conditions during the test and include in such record an explanation to support that such conditions represent normal operation. Upon request, the owner or operator shall make available to the Administrator such records as may be necessary to determine the conditions of performance tests.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1960 Compliance provisions.

(a) Except as provided in § 63.1981(d)(2), the specified methods in paragraphs (a)(1) through (5) of this section must be used to determine whether the gas collection system is in compliance with § 63.1959(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with § 63.1959(b)(2)(ii)(C)(1), either Equation 5 or Equation 6 must be used. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the Administrator. The methane generation rate constant (k) and methane generation potential (L_o) kinetic factors should be those published in the most recent *Compilation of Air Pollutant Emission Factors* (AP-42) or other site-specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in § 63.1959(a)(4), the value of k determined from the test must be used. A value of no more than 15 years must be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

Where:

Qm = Maximum expected gas generation flow rate, m^3/yr.

L_o = Methane generation potential, m^3/Mg solid waste.

R = Average annual acceptance rate, Mg/yr.

k = Methane generation rate constant, $year^{-1}$.

t = Age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years.

c = Time since closure, years (for an active landfill c = 0 and $e^{-kc} = 1$).

2 = Constant.

(ii) For sites with known year-to-year solid waste acceptance rate:

Where:

Qm = Maximum expected gas generation flow rate, m^3/yr.

k = Methane generation rate constant, $year^{-1}$.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of solid waste in the ith section, Mg.

t_i = Age of the ith section, years.

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, Equation 5 or Equation 6 in paragraphs (a)(1)(i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using Equation 5 or Equation 6 in paragraph (a)(1)(i) or (ii) of this section or other methods must be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with § 63.1959(b)(2)(ii)(B)(2), the owner or operator must design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Administrator, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with § 63.1959(b)(2)(ii)(B)(*3*), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well monthly. Any attempted corrective measure must not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval. If a positive pressure exists, follow the procedures as specified in § 60.755(a)(3), except:

(i) Beginning no later than September 27, 2021, if a positive pressure exists, action must be initiated to correct the exceedance within 5 days, except for the three conditions allowed under § 63.1958(b).

(A) If negative pressure cannot be achieved without excess air infiltration within 15 days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in § 63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(j). The owner or operator must keep records according to § 63.1983(e)(5).

(ii) [Reserved]

(4) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c), for the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must follow the procedures as specified in § 60.755(a)(5) of this chapter, except:

(i) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), the owner or operator must monitor each well monthly for temperature. If a well exceeds the operating parameter for temperature as provided in § 63.1958(c)(1), action must be initiated to correct the exceedance within 5 days. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(A) If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) was first measured. The owner or operator must keep records according to § 63.1983(e)(3).

(B) If corrective actions cannot be fully implemented within 60 days following the temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator must submit the items listed in § 63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to § 63.1983(e)(4).

(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to § 63.1981(h)(7) and (j). The owner or operator must keep records according to § 63.1983(e)(5).

(D) If a landfill gas temperature measured at either the wellhead or at any point in the well is greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and the carbon monoxide concentration measured, according to the procedures in § 63.1961(a)(5)(vi) is greater than or equal to 1,000 ppmv the corrective action(s) for the wellhead temperature standard (62.8 degrees Celsius or 145 degrees Fahrenheit) must be completed within 15 days.

(5) An owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(ii)(B)(*4*) through the use of a collection system not conforming to the specifications provided in § 63.1962 must provide information satisfactory to the Administrator as specified in § 63.1981(d)(3) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with § 63.1958(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in § 63.1981(d). Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

(1) 5 years or more if active; or

(2) 2 years or more if closed or at final grade.

(c) The following procedures must be used for compliance with the surface methane operational standard as provided in § 63.1958(d).

(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.

(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of EPA Method 21 of appendix A-7 of part 60 of this chapter, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.

(4) Any reading of 500 ppm or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 63.1958(d).

(i) The location of each monitored exceedance must be marked and the location and concentration recorded. Beginning no later than September 27, 2021, the location must be recorded using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be re-monitored within 10 days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period, a new well or other collection device must be installed within 120 days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this section must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer must meet the instrument specifications provided in section 6 of EPA Method 21 of appendix A of part 60 of this chapter, except that “methane” replaces all references to “VOC”.

(2) The calibration gas must be methane, diluted to a nominal concentration of 500 ppm in air.

(3) To meet the performance evaluation requirements in section 8.1 of EPA Method 21 of appendix A of part 60 of this chapter, the instrument evaluation procedures of section 8.1 of EPA Method 21 of appendix A of part 60 must be used.

(4) The calibration procedures provided in sections 8 and 10 of EPA Method 21 of appendix A of part 60 of this chapter must be followed immediately before commencing a surface monitoring survey.

(e)

(1) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standards in introductory paragraph § 63.1958(e), the provisions of this subpart apply at all times, except during periods of SSM, provided that the duration of SSM does not exceed 5 days for collection systems and does not exceed 1 hour for treatment or control devices. You must comply with the provisions in Table 1 to subpart AAAA that apply before September 28, 2021.

(2) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard in § 63.1958(e)(1), the provisions of this subpart apply at all times, including periods of SSM. During periods of SSM, you must comply with the work practice requirement specified in § 63.1958(e) in lieu of the compliance provisions in § 63.1960.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64400, Oct. 13, 2020]

§ 63.1961 Monitoring of operations.

Except as provided in § 63.1981(d)(2):

(a) Each owner or operator seeking to comply with § 63.1959(b)(2)(ii)(B) for an active gas collection system must install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in § 63.1960(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as follows:

(i) The nitrogen level must be determined using EPA Method 3C of appendix A-2 to part 60 of this chapter, unless an alternative test method is established as allowed by § 63.1981(d)(2).

(ii) Unless an alternative test method is established as allowed by § 63.1981(d)(2), the oxygen level must be determined by an oxygen meter using EPA Method 3A or 3C of appendix A-2 to part 60 of this chapter or ASTM D6522-11 (incorporated by reference, see § 63.14). Determine the oxygen level by an oxygen meter using EPA Method 3A or 3C of appendix A-2 to part 60 or ASTM D6522-11 (if sample location is prior to combustion) except that:

(A) The span must be set between 10- and 12-percent oxygen;

(B) A data recorder is not required;

(C) Only two calibration gases are required, a zero and span;

(D) A calibration error check is not required; and

(E) The allowable sample bias, zero drift, and calibration drift are ±10 percent.

(iii) A portable gas composition analyzer may be used to monitor the oxygen levels provided:

(A) The analyzer is calibrated; and

(B) The analyzer meets all quality assurance and quality control requirements for EPA Method 3A of appendix A-2 to part 60 of this chapter or ASTM D6522-11 (incorporated by reference, see § 63.14).

(3) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c), the owner or operator must follow the procedures as specified in § 60.756(a)(2) and (3) of this chapter. Monitor temperature of the landfill gas on a monthly basis as provided in § 63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter.

(4) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), monitor temperature of the landfill gas on a monthly basis as provided in § 63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter. Keep records specified in § 63.1983(e).

(5) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in § 63.1958(c)(1), unless a higher operating temperature value has been approved by the Administrator under this subpart or under 40 CFR part 60, subpart WWW; 40 CFR part 60, subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR part 60, subpart Cc or 40 CFR part 60, subpart Cf, you must initiate enhanced monitoring at each well with a measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) as follows:

(i) Visual observations for subsurface oxidation events (smoke, smoldering ash, damage to well) within the radius of influence of the well.

(ii) Monitor oxygen concentration as provided in paragraph (a)(2) of this section;

(iii) Monitor temperature of the landfill gas at the wellhead as provided in paragraph (a)(4) of this section.

(iv) Monitor temperature of the landfill gas every 10 vertical feet of the well as provided in paragraph (a)(6) of this section.

(v) Monitor the methane concentration with a methane meter using EPA Method 3C of appendix A-6 to part 60, EPA Method 18 of appendix A-6 to part 60 of this chapter, or a portable gas composition analyzer to monitor the methane levels provided that the analyzer is calibrated and the analyzer meets all quality assurance and quality control requirements for EPA Method 3C or EPA Method 18.

(vi) Monitor carbon monoxide concentrations, as follows:

(A) Collect the sample from the wellhead sampling port in a passivated canister or multi-layer foil gas sampling bag (such as the Cali-5-Bond Bag) and analyze that sample using EPA Method 10 of appendix A-4 to part 60 of this chapter, or an equivalent method with a detection limit of at least 100 ppmv of carbon monoxide in high concentrations of methane; and

(B) Collect and analyze the sample from the wellhead using EPA Method 10 of appendix A-4 to part 60 to measure carbon monoxide concentrations.

(vii) The enhanced monitoring this paragraph (a)(5) must begin 7 days after the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit); and

(viii) The enhanced monitoring in this paragraph (a)(5) must be conducted on a weekly basis. If four consecutive weekly carbon monoxide readings are under 100 ppmv, then enhanced monitoring may be decreased to monthly. However, if carbon monoxide readings exceed 100 ppmv again, the landfill must return to weekly monitoring.

(ix) The enhanced monitoring in this paragraph (a)(5) can be stopped once a higher operating value is approved, at which time the monitoring provisions issued with the higher operating value should be followed, or once the measurement of landfill gas temperature at the wellhead is less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit).

(6) For each wellhead with a measurement of landfill gas temperature greater than or equal to 73.9 degrees Celsius (165 degrees Fahrenheit), annually monitor temperature of the landfill gas every 10 vertical feet of the well. This temperature can be monitored either with a removable thermometer, or using temporary or permanent thermocouples installed in the well.

(b) Each owner or operator seeking to comply with § 63.1959(b)(2)(iii) using an enclosed combustor must calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment:

(1) A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of ±1 percent of the temperature being measured expressed in degrees Celsius or ±0.5 degrees Celsius, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity equal to or greater than 44 megawatts.

(2) A device that records flow to the control device and bypass of the control device (if applicable). The owner or operator must:

(i) Install, calibrate, and maintain a gas flow rate measuring device that must record the flow to the control device at least every 15 minutes; and

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(c) Each owner or operator seeking to comply with § 63.1959(b)(2)(iii) using a non-enclosed flare must install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame; and

(2) A device that records flow to the flare and bypass of the flare (if applicable). The owner or operator must:

(i) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the control device at least every 15 minutes; and

(ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(d) Each owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(iii) using a device other than a non-enclosed flare or an enclosed combustor or a treatment system must provide information satisfactory to the Administrator as provided in § 63.1981(d)(2) describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Administrator must review the information and either approve it, or request that additional information be submitted. The Administrator may specify additional appropriate monitoring procedures.

(e) Each owner or operator seeking to install a collection system that does not meet the specifications in § 63.1962 or seeking to monitor alternative parameters to those required by §§ 63.1958 through 63.1961 must provide information satisfactory to the Administrator as provided in § 63.1981(d)(2) and (3) describing the design and operation of the collection system, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The Administrator may specify additional appropriate monitoring procedures.

(f) Each owner or operator seeking to demonstrate compliance with the 500-ppm surface methane operational standard in § 63.1958(d) must monitor surface concentrations of methane according to the procedures in § 63.1960(c) and the instrument specifications in § 63.1960(d). If you are complying with the 500-ppm surface methane operational standard in § 63.1958(d)(2), for location, you must determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters and the coordinates must be in decimal degrees with at least five decimal places. In the semi-annual report in § 63.1981(h), you must report the location of each exceedance of the 500-ppm methane concentration as provided in § 63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

(g) Each owner or operator seeking to demonstrate compliance with § 63.1959(b)(2)(iii)(C) using a landfill gas treatment system must calibrate, maintain, and operate according to the manufacturer's specifications a device that records flow to the treatment system and bypass of the treatment system (if applicable). Beginning no later than September 27, 2021, each owner or operator must maintain and operate all monitoring systems associated with the treatment system in accordance with the site-specific treatment system monitoring plan required in § 63.1983(b)(5)(ii). The owner or operator must:

(1) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the treatment system at least every 15 minutes; and

(2) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

(h) The monitoring requirements of paragraphs (a), (b), (c), (d), and (g) of this section apply at all times the affected source is operating, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. You are required to complete monitoring system repairs in response to monitoring system malfunctions and to return the monitoring system to operation as expeditiously as practicable. Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph § 63.1958(c)(1), (d)(2), and (e)(1), the standards apply at all times.

[85 FR 17261, Mar. 26, 2020, as amended at 85 FR 64401, Oct. 13, 2020]

§ 63.1962 Specifications for active collection systems.

(a) Each owner or operator seeking to comply with § 63.1959(b)(2)(i) must site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing areas using the following procedures unless alternative procedures have been approved by the Administrator as provided in § 63.1981(d)(2) and (3):

(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

(3) The placement of gas collection devices determined in paragraph (a)(1) of this section must control all gas producing areas, except as provided by paragraphs (a)(3)(i) and (ii) of this section.

(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under § 63.1983(d). The documentation must provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area and must be provided to the Administrator upon request.

(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

(A) The NMOC emissions from each section proposed for exclusion must be computed using Equation 7:

Where:

Q_i = NMOC emission rate from the ith section, Mg/yr.

k = Methane generation rate constant, year^{-1}.

L_o = Methane generation potential, m^3/Mg solid waste.

M_i = Mass of the degradable solid waste in the ith section, Mg.

t_i = Age of the solid waste in the ith section, years.

C_{NMOC} = Concentration of NMOC, ppmv.

3.6×10^{-9} = Conversion factor.

(B) If the owner/operator is proposing to exclude, or cease gas collection and control from, nonproductive physically separated (*e.g.,* separately lined) closed areas that already have gas collection systems, NMOC emissions from each physically separated closed area must be computed using either Equation 3 in § 63.1959(c) or Equation 7 in paragraph (a)(3)(ii)(A) of this section.

ATTACHMENT B

SAMPLE CALIBRATION FORMS

SURFACE EMISSION CALIBRATION PRECISION TEST RECORD

CALIBRATION DATE: ______________________________
TIME:

EXPIRATION DATE (3 MOS.): ______________________________

INSTRUMENT MAKE: ______________________________
MODEL: ______________________________
S/N: ______________________________
Calibration Gas Lot #:
Calibration Gas Concentration (PPM):
Calibration Gas Expiration:

MEASUREMENT #1:

Meter Reading for Zero Air:	ppm (a)	_______________
Meter Reading for Calibration Gas:	ppm (b)	_______________

MEASUREMENT #2:

Meter Reading for Zero Air:	ppm (c)	_______________
Meter Reading for Calibration Gas:	ppm (d)	_______________

MEASUREMENT #3:

Meter Reading for Zero Air:	ppm (e)	_______________
Meter Reading for Calibration Gas:	ppm (f)	_______________

CALCULATE PRECISION: 500

$$\frac{[500 - (b)] + [500 - (d)] + [500 - (f)]}{3} \times \frac{1}{500} \times 100$$

% (must be less than 10%)

PERFORMED BY: _______________

SURFACE EMISSION RESPONSE TIME TEST RECORD

DATE: ______________________________
TIME:

INSTRUMENT MAKE: ______________________________
MODEL: ______________________________
S/N: ______________________________

MEASUREMENT #1:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (1)

MEASUREMENT #2:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (2)

MEASUREMENT #3:

Stabilized Reading Using Calibration Gas: _______________ ppm
90% of the Stabilized Readings: _______________ ppm
Time to Reach 90% of Stabilized reading after starting from Zero Air to Calibration Gas
_______________ seconds (3)

CALCULATE PRECISION:

$$\frac{(1) + (2) + (3)}{3} =$$ seconds (MUST BE LESS THAN 30 SECONDS)

PERFORMED BY: _______________

SURFACE EMISSION
CALIBRATION PROCEDURE AND BACKGROUND DETERMINATION REPORT

INSTRUMENT MAKE: ______________________________
MODEL: ______________________________
S/N: ______________________________

Calibration Procedure

1. Allow instrument to internally zero itself while introducing zero air.

2. Introduce calibration gas into the probe.
Stable reading = _______________ ppm

3. Adjust meter to read 500 ppm.

Background Determination Procedure

1. Upwind Reading (highest in 30 seconds): _______________ ppm (1)

2. Downwind Reading (highest in 30 seconds): _______________ ppm (2)

Calculate Background Value:

$$\frac{(1) + (2)}{2}$$

Background = _______________ ppm

PERFORMED BY:

____

Date: ______________________________
Time: _______________

ATTACHMENT C

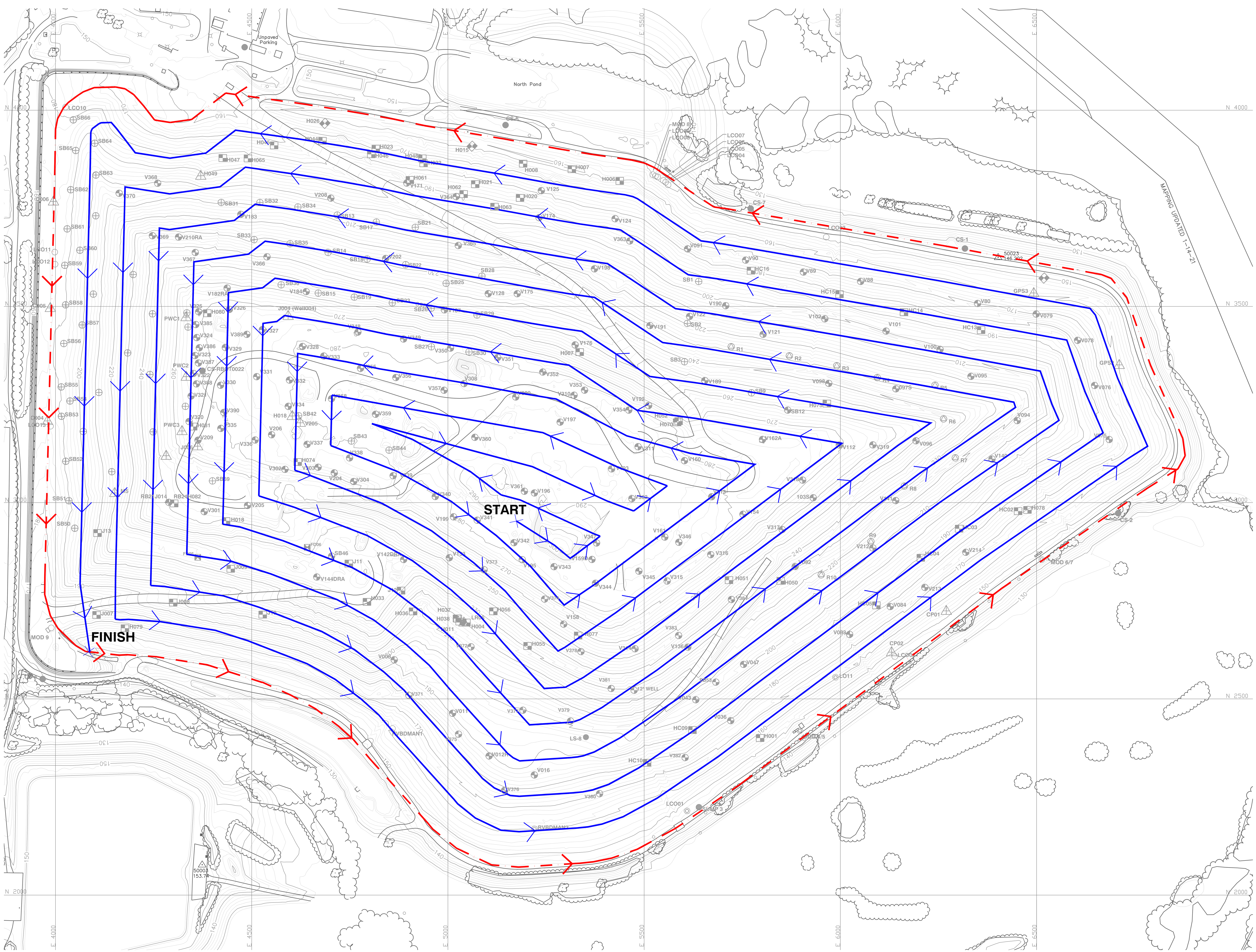
SAMPLE EXCEEDANCE LOG

Riverbend Landfill
Surface Emissions Monitoring
Summary of Exceedances

Initial Monitoring Event							Corrective Action		1st 10-day Follow-Up		1-Month Follow-Up		Extra 10-day Follow-Up		Extra 1-Month Follow-Up	
ID	Date	Type	Description	Longitude	Latitude	CH_4 (ppm)	Date	Description	Date	CH_4 (ppm)	Date	CH_4 (ppm)	Date	CH_4 (ppm)	Date	CH_4 (ppm)

Attachment C

SEM Route



0 120 240 360
GRAPHIC SCALE (FEET)

N

LEGEND

- EXTRACTION WELL
- EXTRACTION WELL - REDUCED BOREHOLE
- WELLHEAD MANIFOLD
- HORIZONTAL COLLECTOR WELLHEAD
- SURFACE EMISSIONS MONITORING ROUTE
- PERIMETER SURFACE EMISSIONS MONITORING ROUTE
- LANDFILL FOOTPRINT

NOTES:

1. AERIAL FOR TOPOGRAPHIC CONTOURS FLOWN JANUARY 14, 2021 BY MILLER CREEK ASSOCIATES.
2. AS-BUILT LFG SYSTEM INFORMATION PRIOR TO MAY 2020 PROVIDED BY RIVERBEND LANDFILL CO. AND LELAND MACDONALD & ASSOCIATES, LLC.
3. NOTE THAT SOME LFG SYSTEM FEATURES MAY BE DIFFERENT THAN SHOWN HERE DUE TO MODIFICATIONS MADE BY OWNER OR THEIR CONTRACTORS TO ACCOMMODATE LANDFILL OPERATIONS OR COMPLIANCE.
4. 2020 PHASE 1 WELL LOCATIONS PROVIDED TO CEC BY WM ON NOVEMBER 20, 2020. MODIFICATIONS TO THESE LOCATIONS AS WELL AS THE PIPING ASSOCIATED WITH THESE WELLS HAS BEEN UPDATED PER ASBUILT DRAWINGS "9170 GAS ASBUILT 10-19-20.DWG" PROVIDED BY LEELAND MACDONALD & ASSOCIATES .
5. 2020 PHASE 2 WELL LOCATIONS AND ASSOCIATED PIPING TAKEN FROM ASBUILT DRAWINGS "7182 ASBUILTS 1-14-21 EXPLORT.DWG" PROVIDED BY LEELAND MACDONALD & ASSOCIATES.
6. CERTAIN GCCS FEATURES (HORIZONTAL COLLECTOR PIPING, SUB CAP DRAINLINES, GCCS PIPING, FITTINGS, ETC.) HAVE BEEN REMOVED FROM THIS DRAWING FOR PURPOSES OF CLARITY. HORIZONTAL COLLECTOR WELLHEADS HAVE NOT BEEN REMOVED.
7. ROUTE BASED ON INFORMATION PROVIDED BY RIVERBEND LANDFILL CO. ROUTE TO BE APPROVED BY RIVERBEND LANDFILL CO. PRIOR TO INITIAL MONITORING.

FOR PLANNING PURPOSES ONLY

CARLSON ENVIRONMENTAL CONSULTANTS, PC
1015 4TH AVE W - SUITE G
OLYMPIA, WASHINGTON 98502
(704) 283-9765 FAX (704) 283-9755
CEC COA#: 1192731-91

APRIL 2021

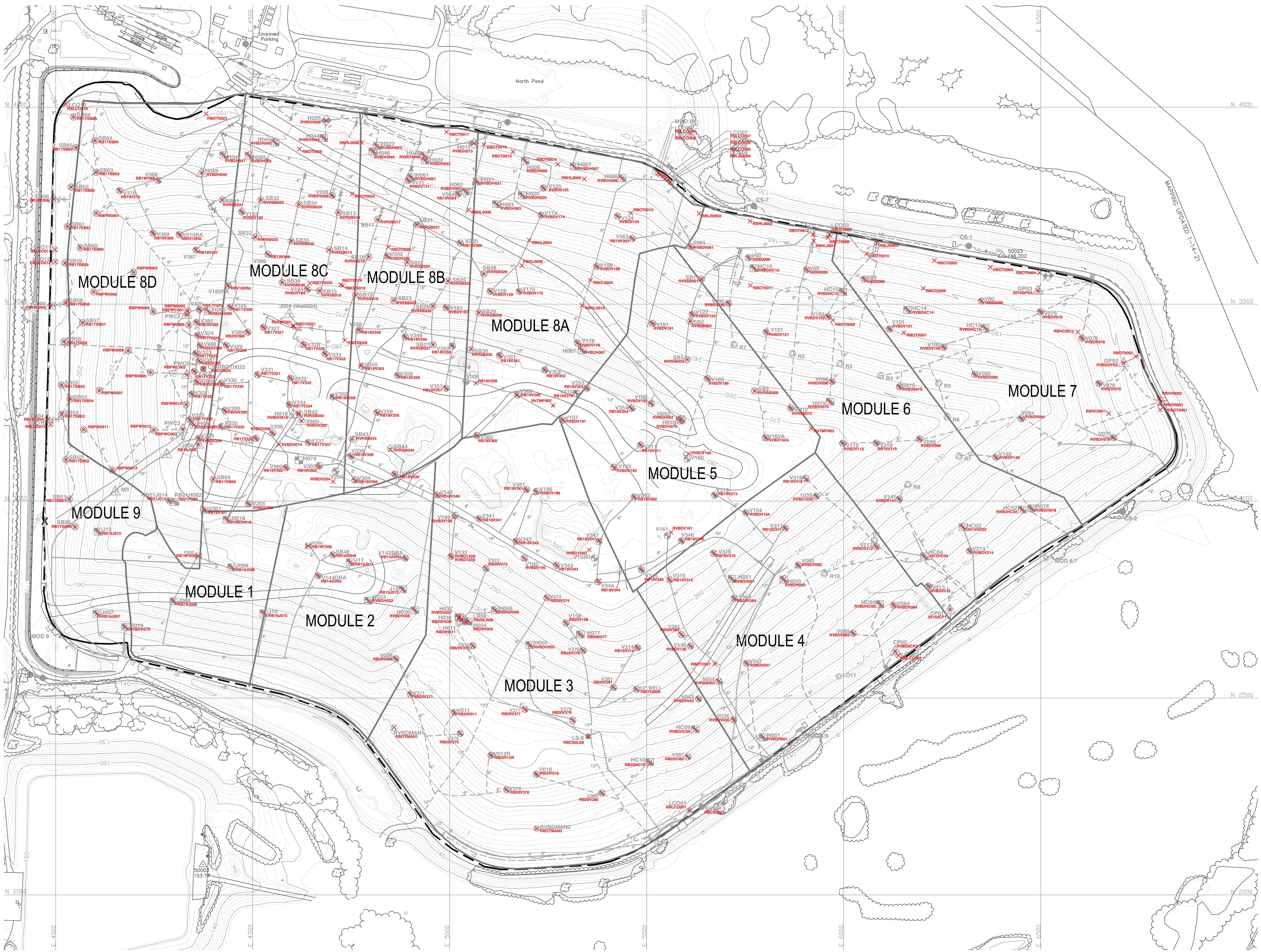
WASTE MANAGEMENT

FIGURE 3 - SEM ROUTE MAP

RIVERBEND LANDFILL

Attachment D

Penetration Map



N

0 120 240 360
GRAPHIC SCALE (FEET)

LEGEND

EXISTING FEATURES

- ABOVE GRADE HEADER/LATERAL
- BELOW GRADE HEADER/LATERAL
- FM OR DRAINLINE
- EXTRACTION WELL
- EXTRACTION WELL - REDUCED BOREHOLE
- WELLHEAD MANIFOLD
- HORIZONTAL COLLECTOR WELLHEAD
- SUB-CAP COLLECTOR WELLHEAD
- CONDENSATE SUMP
- FRENCH DRAIN
- LFG VALVE
- BLIND FLANGE
- LFG PIPE REDUCER
- MODULE LIMITS

NOTES:

1. AERIAL FOR TOPOGRAPHIC CONTOURS FLOWN JANUARY 14, 2021 BY MILLER CREEK ASSOCIATES.
2. AS-BUILT LFG SYSTEM INFORMATION PRIOR TO MAY 2020 PROVIDED BY RIVERBEND LANDFILL CO. LELAND MACDONALD & ASSOCIATES, LLC. SURVEYING FROM 2020 PHASE 2 AND IN 2021 PROVIDED BY PACIFIC COMMUNITY DESIGN.
3. NOTE THAT SOME LFG SYSTEM FEATURES MAY BE DIFFERENT THAN SHOWN HERE DUE TO MODIFICATIONS MADE BY OWNER OR THEIR CONTRACTORS TO ACCOMMODATE LANDFILL OPERATIONS OR COMPLIANCE.
4. 2020 PHASE 1 WELL LOCATIONS PROVIDED TO CEC BY WM ON NOVEMBER 20, 2020. MODIFICATIONS TO THESE LOCATIONS AS WELL AS THE PIPING ASSOCIATED WITH THESE WELLS HAS BEEN UPDATED PER ASBUILT DRAWINGS "9170 GAS ASBUILT 10-19-20.DWG" PROVIDED BY LEELAND MACDONALD & ASSOCIATES .
5. 2020 PHASE 2 WELL LOCATIONS AND ASSOCIATED PIPING TAKEN FROM ASBUILT DRAWINGS "7182 ASBUILTS 1-14-21 EXPLORT.DWG" PROVIDED BY LEELAND MACDONALD & ASSOCIATES.
6. CERTAIN GCCS FEATURES (HORIZONTAL COLLECTOR PIPING AND SUB CAP DRAINLINES) HAVE BEEN REMOVED FROM THIS DRAWING FOR PURPOSES OF CLARITY
7. LIST OF CURRENT KNOWN PENETRATIONS AT REVEREND LANDFILL RECEIVED FROM WM ON FEBRUARY 9, 2021. FILE NAME "RBL SEM PENETRATION SHEET 2021-02-09".
8. ADDITIONAL PENETRATIONS HAVE BEEN ADDED TO "RBL SEM PENETRATION SHEET 2021-02-09". THESE INCLUDE: PENETRATIONS FOUND DURING SITE WALKS (WM AND CEC) ON JANUARY 20 & 21, 2021. NEWLY INSTALLED PHASE 2 2020 WELLS (SEE NOTE 6). ADDITIONAL KNOWN PENETRATIONS SEEN IN THE FIELD.
9. COVER PENETRATIONS, FOR THE PURPOSE OF THIS INVENTORY ARE DEFINED AS, A WELLHEAD, A PART OF THE LANDFILL GAS COLLECTION OR OPERATIONS SYSTEM, AND/OR ANY OTHER OBJECT THAT COMPLETELY PASSES THROUGH THE LANDFILL COVER. THE LANDFILL COVER INCLUDES THAT PORTION WHICH COVERS THE WASTE, AS WELL AS THE PORTION WHICH BORDERS THE WASTE EXTENDED TO THE POINT WHERE IT IS SEALED WITH THE LANDFILL LINER OR THE SURROUNDING LAND MASS. EXAMPLES OF WHAT IS NOT A PENETRATION FOR THE PURPOSES OF THIS SUBPART INCLUDE BUT ARE NOT LIMITED TO: SURVEY STAKES, FENCING INCLUDING LITTER FENCES, FLAGS, SIGNS, UTILITY POSTS, AND TREES SO LONG AS THESE ITEMS DO NOT PASS THROUGH THE LANDFILL COVER. WM DEFINES "OPENINGS TO MEAN ANY COVER PENETRATION AS DEFINED ABOVE AND ANY AREA WHERE WASTE HAS BEEN PLACED AND A GAS COLLECTION SYSTEM IS REQUIRED BY NSPS XXX/NESHAP AAAA THAT VISUALLY EXHIBITS DISTRESSED VEGETATION AND CRACKS AND SEEPS IN THE COVER.

DEVICE ABBREVIATIONS	ABBREVIATION DEFINITION
V	VERTICAL WELL (STANDARD)
H	HORIZONTAL COLLECTOR
R	SUBCAP WELLHEAD
HC	HORIZONTAL COLLECTOR
SB	SMALL BORING VERTICAL WELL
PWC	PIN WELL COLLECTOR
CS	CONDENSATE SUMP
LCO	LEACHATE CLEAN OUT
FD	FRENCH DRAIN
LR	LEACHATE RISER
R	RIBBON COLLECTOR
HV	HEADER VALVE
HL	HEADER LINE
OT	OTHER PENETRATION
MOD	MOD LEACHATE CLEANOUT
J	COLLECTION LINE

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CEC COA#: 1192731-91

APRIL 2021

WASTE MANAGEMENT

FIGURE 4 - SEM PENETRATION MAP

RIVERBEND LANDFILL

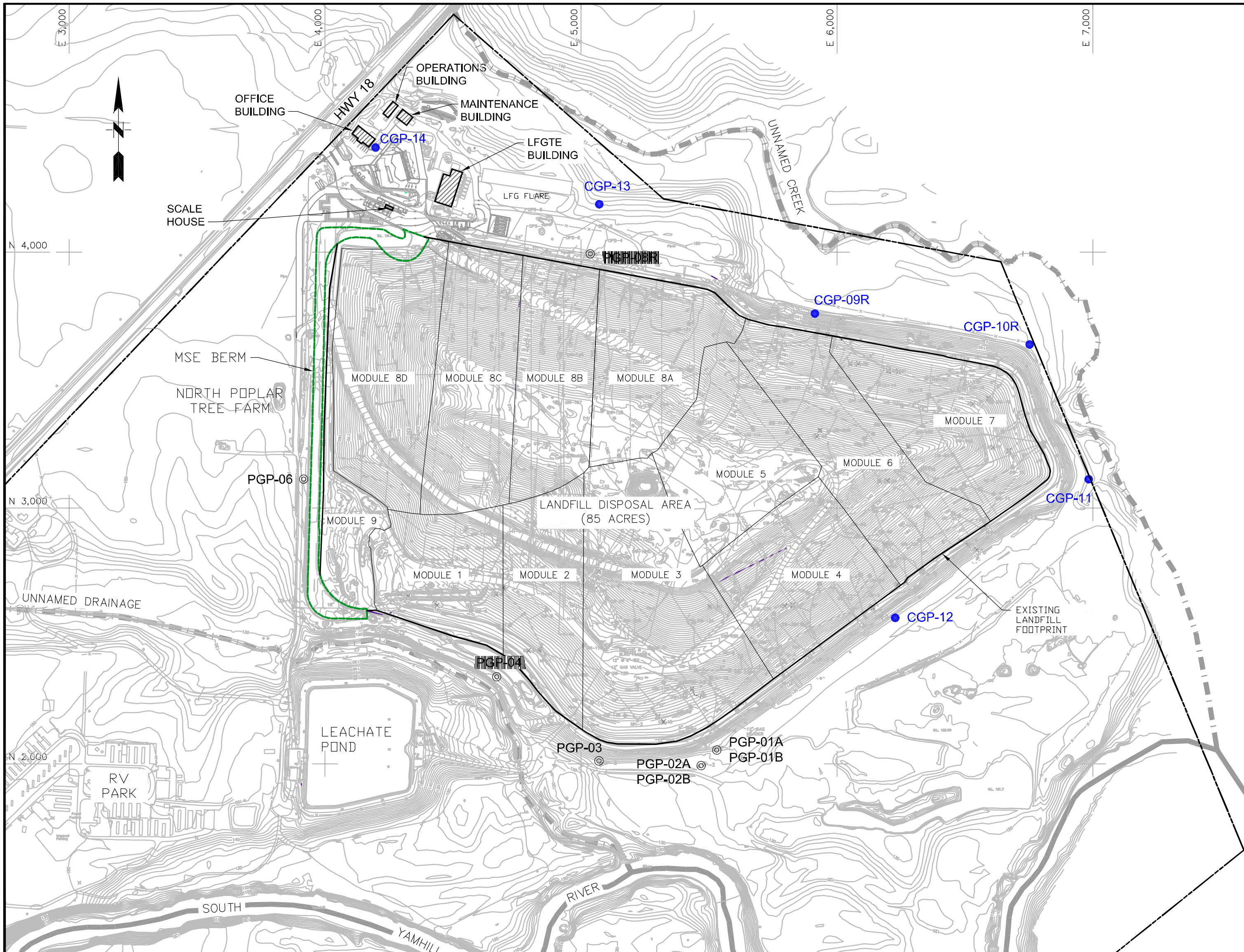
Attachment E

Upwind/Downwind Measurement Points


Riverbend Landfill
Upwind / Downwind Background Calibration Points

Attachment F

LFG Migration Probe Map



LEGEND:

- Topographic Contours (Surveyed)
- Topographic Contours (USGS)
- Property Boundary
- Waste Module Boundary Line
- Flow Line - Yamhill River
- Flow Line - Tributary Stream
- CGP-12 ● Compliance Landfill Gas Monitoring Probe
- PGP-06 ◎ Performance Evaluation Landfill Gas Monitoring Probe

SOURCE:

1) Existing contours based on aerial topography provided by Miller Creek Aerial Mapping, date of photograph March 22, 2014. Contours are based on NAVD 88.

2) Horizontal Datum: Assumed
Iron pipe at scale house = N4000.000 E4000.000
Iron pipe at maintenance building = N2825.685 E4000.000

NOTES:

1) Phase I A of the mechanically stabilized earthen (MSE) berm (approximate southern half) is completed. Phase I B of the MSE berm (approximate northern half) is currently under construction.

SCS ENGINEERS
Environmental Consultants and Contractors
14945 SW Sequoia Parkway, Suite 180
Portland, Oregon 97224
(503) 639-9201 FAX: (503) 684-6948

0 400 800
SCALE IN FEET

PROJECT NO. 04208022.14	DES BY D.L.	MONITORING LOCATIONS LANDFILL GAS MONITORING PLAN	DATE DECEMBER 2014
SCALE AS SHOWN	CHK BY D.L.	RIVERBEND LANDFILL McMINNVILLE, OREGON	FIGURE B-2
CAD FILE FIGURE B-2	APP BY L.C.		

ATTACHMENT 3

ENHANCED SEM TRAINING ATTENANCE LIST

Riverbend Landfill

Enhanced Surface Emissions Monitoring Training

10/20/2021

Presenter: Matt Rana, Riverbend Landfill

Attendee List:

Name	Title	Company	Signature
Travis Williams	AGOM II	WM	T. Williams
Riley Stupek	gas tech	WM	[illegible]
Tiffany Andrews	Project Scientist	SCS	[illegible]
Ian Hultquist	Staff Scientist	SCS	[illegible]
Dwight Anderson	field Technician	Re S	[illegible]
RICK LEMOS	FIELD TECH	RES	[illegible]
Calvin Diaz	FIELD TECH	Res	[illegible]
Lewis Ward	Supervisor	Res	[illegible]

ATTACHMENT 4

ENHANCED SEM VERIFICATION

WASTE MANAGEMENT
7227 NE 55th Avenue
Portland, Oregon 97218
(503) 331-2262

November 5, 2021

Mr. Nicholas Godfrey
Riverbend Landfill
13469 SW Highway 18
McMinnville, Oregon 97128

RE: Riverbend Landfill Enhanced SEM Monitoring
Fourth Quarter 2021 Verification

Dear Mr. Godfrey:

Pursuant to Paragraph 64 of Riverbend Landfill Co's Administrative Compliance Order (ACO) with the U.S. Environmental Protection Agency (EPA), effective September 10, 2021, this document represents the verification of the Fourth Quarter 2021 Enhanced SEM. Paragraph 64 outlines the following requirements for quarterly verification of the SEM:

> *Paragraph 64: No later than 90 days from the Effective Date of this Order, Respondent shall implement verifications of each quarterly Enhanced SEM Monitoring event by technical staff not performing the Enhanced SEM Monitoring for the following:*
>
> *a. Path taken and implementation of Method 21;*
>
> *b. Documentation and reporting;*
>
> *c. Corrective actions;*
>
> *d. Monitoring data for feasibility and unusual trends;*
>
> *e. Calibration records and equipment maintenance in compliance with Method 21 and the manufacturers' recommendations; and*
>
> *f. Recordkeeping.*

Discussions for each bullet point are presented below.

Path Taken and Implementation of Method 21

Raw data files were converted and uploaded to Google Earth to confirm the monitoring path and monitoring of penetrations and gas migration probes. A small portion of the southwest corner of the site, covered with black tarp was excluded from monitoring due to the area being unsafe to navigate. This area is less than 2 percent of the total monitoring area. The approximate monitoring point locations are shown in Attachment A.

A review of raw data files along with the GPS data showed that RES technicians were following the Enhanced SEM and Method 21 procedures when elevated emissions were observed.

Documentation and Reporting

Upwind/downwind calibration locations were documented. Exceedance data collected in the field using handheld GPS units and tabulated by RES in the electronic log. Upon completion of all remonitoring activities, an Enhanced SEM report will be prepared that includes data collected during monitoring, calibration records, exceedance tables, and maps showing exceedance locations.

Corrective Actions

RES identified 47 exceedance locations on October 21 and 22, 2021. The RLC Gas Technician reviewed all exceedance locations after the conclusion of monitoring. Corrective actions are described below:

- Repairs at all exceedance locations (addition of cover/bentonite, vacuum adjustments, spray foam, penetration seal repairs, etc.) were completed starting October 22, 2021 through October 28, 2021.
- The 10-day remonitoring event was completed October 29, 2021; 8 of the 47 exceedance locations were observed with methane concentrations greater than 500 ppmv.
- Additional repairs are currently in progress and will be completed by November 8, 2021.
- A second 10-day remonitoring event will be completed by November 8, 2021.
- The 1-month remonitoring event will be completed between November 16 to 19, 2021.

Monitoring Data for Feasibility and Unusual Trends

No infeasible data was observed. As typically seen on the TVA2020, there were intermittent periods where the device records continuous methane data at the same GPS location. This is a hardware limitation of the device. Despite this, RES can accurately identify the exceedance locations because these are documented using a handheld GPS device, which is more accurate than the TVA2020.

Calibration Records and Equipment Maintenance in Compliance with Method 21 and the Manufacturer's Recommendations

Calibration was observed by the RLC Gas Technician and SCS Engineers. All equipment appeared to be in good working order. Calibration records were submitted to RLC confirming all devices were properly and calibration gases used were appropriate.

Recordkeeping

Raw data files were sent by RES daily after completion of monitoring. RLC and RES coordinated throughout the monitoring to ensure that all areas safe to monitor were included. After completion of the event, copies of calibration data, exceedance logs, and field generated maps were also submitted by RES. Pursuant to Title V rules, all data will be retained for a minimum of five years.

Applicable data will be included in the next SEM report, which will be prepared after all monitoring is completed.

Closing

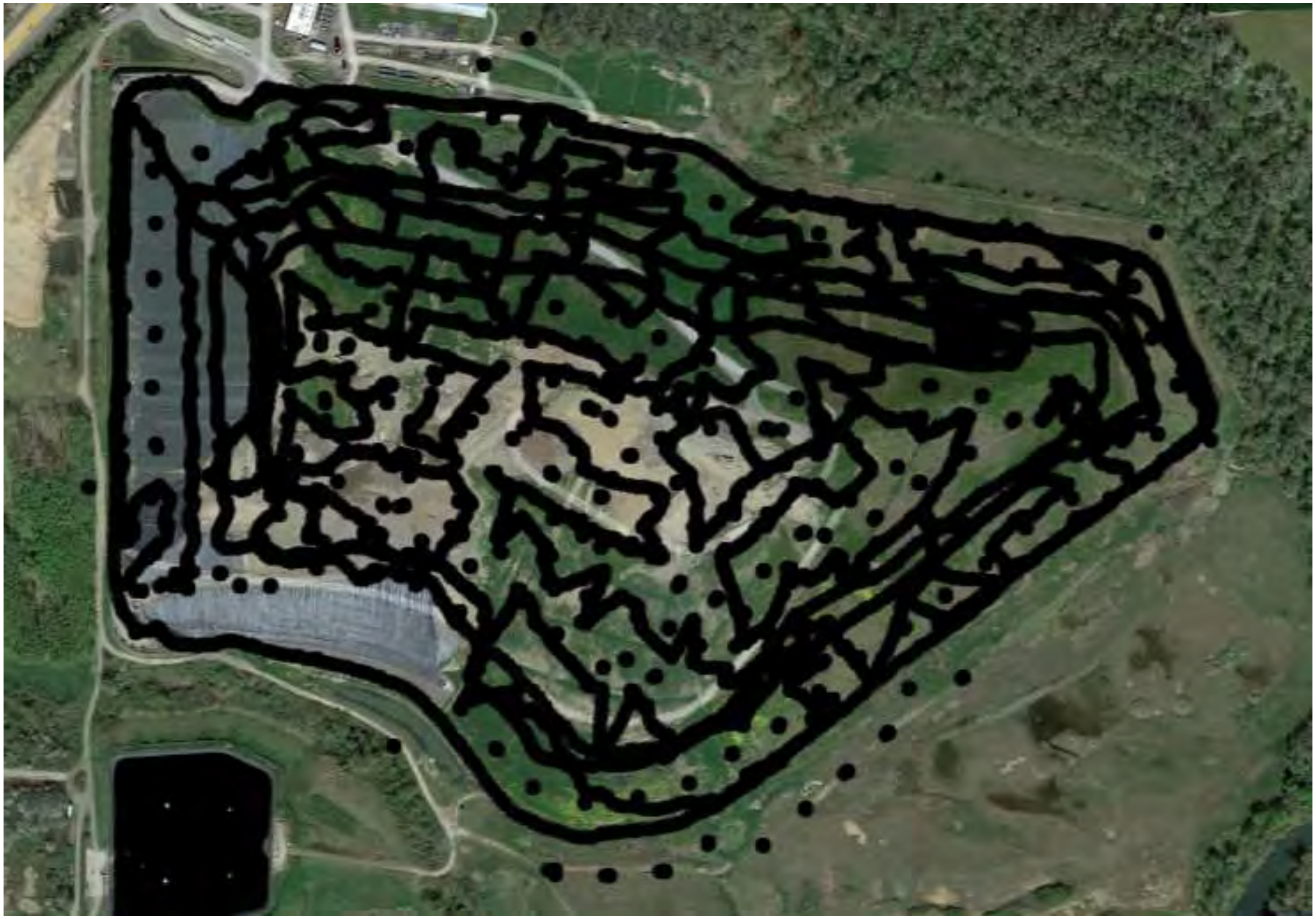
Based on the criteria describe in this letter, the Fourth Quarter 2021 Enhanced SEM event was conducted consistent with the ACO requirements. As previously discussed, upon completion of all remonitoring events, a final Enhanced SEM report will be prepared. Please contact me at 510-613-3508 or by e-mail at mrana@wm.com if you have any questions regarding this letter or require further information.

Sincerely,

Matt Rana
Environmental Protection Specialist

ATTACHMENT A

MONITORING POINT LOCATIONS



Approximate Monitoring Point Locations

Several points shown represent samples where Device GPS was intermittently connecting, resulting in the apparent placement of multiple readings in the exact same locations

ATTACHMENT 5

ENHANCED SEM REVIEW AND THIRD-PARTY AUDIT CHECKLISTS

Version date: October 2021

Riley Slmpek
10/21/21

Riverbend Landfill
General/Enhanced Surface Emissions Monitoring Assessment Checklist

Device Calibration Procedures and Setup

Device was calibrated per Method 21 requirements	Yes	No	N/A
Upwind/Downwind measurements were taken at least 100 feet from edge of waste	Yes	No	N/A
Calibrations were completed using proper gas compositions	Yes	No	N/A
Monitoring equipment was in good working order	Yes	No	N/A
Technicians had maps and pin flags available for tracking path and documenting exceedance areas	Yes	No	N/A
Comments			

General Surface Emissions Monitoring Procedures

Probe was kept between 2-4 inches of landfill surface during monitoring	Yes	No	N/A
Technician followed monitoring path using a 100-foot spacing (excluding dangerous/active areas)	Yes	No	N/A
Comments			

Enhanced Surface Emissions Monitoring Procedures

Monitoring device was set up using 300 ppmv as a low alarm setpoint	Yes	No	N/A
Monitoring device records GPS data to record route taken during monitoring	Yes	No	N/A
Surface monitoring at perimeter gas probes included 10-foot radius of accessible area	Yes	No	N/A
Technician appeared to survey surroundings to look for areas with possible elevated emissions	O		
Comments			

Areas with Elevated Surface Emissions

Were any areas above 300 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Upon device alert, did technician halt forward progress for at least 15 seconds to make observations of area, identify areas of concern, and measure highest reading in area?	Yes	No	N/A
After completing readings, did technician restart monitoring from the same point where initial alarm was observed?	Yes	No	N/A
Were any areas over 500 ppmv observed? (if yes, complete questions in next section)	Yes	No	N/A
Comments			

Areas with CH4 >500 ppm

Were any areas above 500 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Technician used several brightly colored pin flags with unique ID	Yes	No	N/A
Exceedance location was recorded using GPS locator accurate to 4 meters	Yes	No	N/A
Pictures of the area were taken showing general condition of area	Yes	No	N/A
Flag number and GPS coordinates recorded on field log	Yes	No	N/A
Comments	Pictures taken by WM.		

Summary of deficiencies noted (specify those that require a modification to current written procedures):

Name/Title	Riley Stupek gas tech	Company	WM
Signature		Date	10/21/21

Version date: October 2021

Riverbend Landfill
General/Enhanced Surface Emissions Monitoring
Assessment Checklist

Device Calibration Procedures and Setup

Device was calibrated per Method 21 requirements	Yes	No	N/A
Upwind/Downwind measurements were taken at least 100 feet from edge of waste	Yes	No	N/A
Calibrations were completed using proper gas compositions	Yes	No	N/A
Monitoring equipment was in good working order	Yes	No	N/A
Technicians had maps and pin flags available for tracking path and documenting exceedance areas	Yes	No	N/A
Comments	Calibration performed using tedlar bags. Riley observed up/downwind. Only witnessed 1/4 units being calibrated.		

General Surface Emissions Monitoring Procedures

Probe was kept between 2-4 inches of landfill surface during monitoring	Yes	No	N/A
Technician followed monitoring path using a 100-foot spacing (excluding dangerous/active areas)	Yes	No	N/A
Comments	The probe was sometimes raised above 2-4 inches. The issue was noticed by Calvin and promptly adjusted		

Enhanced Surface Emissions Monitoring Procedures

Monitoring device was set up using 300 ppmv as a low alarm setpoint	Yes	No	N/A
Monitoring device records GPS data to record route taken during monitoring	Yes	No	N/A
Surface monitoring at perimeter gas probes included 10-foot radius of accessible area	Yes	No	N/A
Technician appeared to survey surroundings to look for areas with possible elevated emissions	Yes		
Comments	GPS device also used. Crack, rills, and other areas were checked		

Areas with Elevated Surface Emissions

Were any areas above 300 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Upon device alert, did technician halt forward progress for at least 15 seconds to make observations of area, identify areas of concern, and measure highest reading in area?	Yes	No	N/A
After completing readings, did technician restart monitoring from the same point where initial alarm was observed?	Yes	No	N/A
Were any areas over 500 ppmv observed? (if yes, complete questions in next section)	Yes	No	N/A
Comments			

Areas with CH4 >500 ppm

Were any areas above 500 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Technician used several brightly colored pin flags with unique ID	Yes	No	N/A
Exceedance location was recorded using GPS locator accurate to 4 meters (recorded/not sure accuracy)	Yes	No	N/A
Pictures of the area were taken showing general condition of area	Yes	No	N/A
Flag number and GPS coordinates recorded on field log	Yes	No	N/A
Comments	GPS reading were recorded on GPS unit and an electronic log was sent to WM. Photos were taken at each location during/following SEM.		

Summary of deficiencies noted (specify those that require a modification to current written procedures):

Probe needs to be kept consistently at 2-4 inches above landfill surface. A camera or phone needs to be carried for pictures real time if possible.

Name/Title	Tiffany Andrews /	**Company**	SCS
Signature	[signature]	**Date**	10/20/21

Riverbend Landfill
General/Enhanced Surface Emissions Monitoring
Assessment Checklist

Device Calibration Procedures and Setup

Device was calibrated per Method 21 requirements	Yes	No	N/A
Upwind/Downwind measurements were taken at least 100 feet from edge of waste	Yes	No	N/A
Calibrations were completed using proper gas compositions	Yes	No	N/A
Monitoring equipment was in good working order	Yes	No	N/A
Technicians had maps and pin flags available for tracking path and documenting exceedance areas	Yes	No	N/A
Comments	Calibration was performed with correct gas concentrations, and unexpired gas. gas was pumped into Tedlar bags to perform calibration. Only observed 1/4 units calibrated. Only witnessed downwind calibration.		

General Surface Emissions Monitoring Procedures

Probe was kept between 2-4 inches of landfill surface during monitoring	Yes	No	N/A
Technician followed monitoring path using a 100-foot spacing (excluding dangerous/active areas)	Yes	No	N/A
Comments	Probe was kept at appropriate height during monitoring.		

Enhanced Surface Emissions Monitoring Procedures

Monitoring device was set up using 300 ppmv as a low alarm setpoint	Yes	No	N/A
Monitoring device records GPS data to record route taken during monitoring	Yes	No	N/A
Surface monitoring at perimeter gas probes included 10-foot radius of accessible area	Yes	No	N/A
Technician appeared to survey surroundings to look for areas with possible elevated emissions	yes		
Comments	GPS was used, all perimeter probes were monitored before proceeding with penetration monitoring.		

Areas with Elevated Surface Emissions

Were any areas above 300 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Upon device alert, did technician halt forward progress for at least 15 seconds to make observations of area, identify areas of concern, and measure highest reading in area?	Yes	No	N/A
After completing readings, did technician restart monitoring from the same point where initial alarm was observed?	Yes	No	N/A
Were any areas over 500 ppmv observed? (if yes, complete questions in next section)	Yes	No	N/A
Comments			

Areas with CH4 >500 ppm

Were any areas above 500 ppmv observed by technician? (if yes, complete questions below)	Yes	No	N/A
Technician used several brightly colored pin flags with unique ID	Yes	No	N/A
Exceedance location was recorded using GPS locator accurate to 4 meters	Yes	No	N/A
Pictures of the area were taken showing general condition of area	Yes	No	N/A
Flag number and GPS coordinates recorded on field log	Yes	No	N/A
Comments	Recorded Flag number and GPS Coordinates on field log for penetration monitoring exceedence locations. Technician used one flag to mark penetration exceedance locations which is sufficient for penetrations.		

Summary of deficiencies noted (specify those that require a modification to current written procedures):

Technician kept probe at correct height while conducting penetration monitoring. At the first couple penetrations, the technician would monitor downwind and sides of penetration, but not completely around penetrations. Technician noted practice and adjusted to monitoring completely around penetration circumference.

Name/Title	Ian Hultquist/Staff Professional	**Company**	SCS
Signature		**Date**	11/1/2021

ATTACHMENT 6

ENHANCED SEM REVIEW WORK ORDERS

Riverbend Landfill

Cover Integrity Monitoring and Surface Emissions Monitoring

Work Order Summary Sheet - Fourth Quarter 2021

Initial Monitoring Event							Corrective Action		1st 10-day Follow-Up		2nd 10-day Follow-Up		1-Month Follow-Up	
Work Order#	Date	Type (SEM / Cover)	Description	Longitude	Latitude	CH_4 (ppm)	Date	Description	Date	CH_4 (ppm)	Date	CH_4	Date	CH_4 (ppm)
O001	10/20/2021	Surface > 500 ppm	Surface, north side of Mod 2 road	45.16079	-123.25053	502	10/28/2021	Placed clean soil and compacted	10/29/2021	51				
O002	10/20/2021	Surface > 500 ppm	Surface, north side of Mod 2 road	45.16078	-123.25076	1,036	10/28/2021	Placed clean soil and compacted	10/29/2021	17				
O003	10/20/2021	Surface > 500 ppm	Surface, Mod 1 road	45.16069	-123.25166	643	10/28/2021	Placed clean soil and compacted	10/29/2021	71				
O004	10/20/2021	Surface > 500 ppm	Surface, Mod 1 road	45.16070	-123.25229	973	10/28/2021	Placed clean soil and compacted	10/29/2021	266				
O005	10/20/2021	Surface > 500 ppm	Surface, next to RB19J009	45.16090	-123.25147	1,000	10/28/2021	Placed clean soil and compacted	10/29/2021	438				
O006	10/21/2021	Penetration > 500 ppm	RVBDH001	45.15970	-123.24624	506	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	36				
O007	10/21/2021	Penetration > 500 ppm	RB20V384	45.16080	-123.24651	2,450	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	176				
O008	10/21/2021	Penetration > 500 ppm	RB16V316	45.16112	-123.24674	2,203	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	334				
O009	10/21/2021	Penetration > 500 ppm	RVBDV122	45.16279	-123.24697	1,243	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	4				
O010	10/21/2021	Penetration > 500 ppm	RVBDV193	45.16168	-123.24774	892	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	147				
O011	10/20/2021	Surface > 500 ppm	Surface	45.16143	-123.25176	500	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	43				
O012	10/20/2021	Surface > 500 ppm	Surface	45.16082	-123.25071	645	10/28/2021	Placed clean soil and compacted	10/29/2021	315				
O013	10/20/2021	Surface > 500 ppm	Surface	45.16077	-123.25043	1,400	10/28/2021	Placed clean soil and compacted	10/29/2021	77				
O014	10/20/2021	Surface > 500 ppm	Surface, tarped area	45.16311	-123.25225	500	10/28/2021	Used expanding foam and buytle tape to seal area with escaping gas.	10/29/2021	34,154	11/8/2021	4		
O015	10/21/2021	Penetration > 500 ppm	RBOT0012	45.16335	-123.24583	1,200	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	1,918	11/8/2021	120		
O016	10/21/2021	Penetration > 500 ppm	RBHL0002	45.16342	-123.24645	600	10/28/2021	Filled hole from previous repair with clean soil and compacted	10/29/2021	47				
O017	10/21/2021	Penetration > 500 ppm	Mod 6/7 Riser Pipe	45.16118	-123.24354	1,600	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	357				
O021	10/20/2021	Penetration > 500 ppm	RB19J013	45.16116	-123.25281	1,004	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	48				
O022	10/20/2021	Penetration > 500 ppm	RB17SB66	45.16412	-123.25317	1,400	10/28/2021	Dug in an area around flag. Placed a layer of bentonite. Covered with soil and compacted.	10/29/2021	8				
O023	10/20/2021	Penetration > 500 ppm	WELL370	45.16355	-123.25267	9,400	10/28/2021	Used expanding foam and buytle tape to seal area with escaping gas.	10/29/2021	120				
O024	10/20/2021	Penetration > 500 ppm	RB17SB63	45.16339	-123.25269	2,020	10/28/2021	Removed inactive well and placed a patch around the area where the well was. Sealed with expanding foam and buytle tape.	10/29/2021	414				
O025	10/20/2021	Penetration > 500 ppm	RB19V369	45.16324	-123.25231	774	10/28/2021	Used expanding foam and buytle tape to seal area with escaping gas.	10/29/2021	5,176	11/8/2021	84		
O026	10/20/2021	Penetration > 500 ppm	Tarp Well	45.16300	-123.25216	700	10/28/2021	Removed inactive well and placed a patch around the area where the well was. Sealed with expanding foam and buytle tape.	10/29/2021	1,479	11/8/2021	3		
O027	10/20/2021	Penetration > 500 ppm	RB17V322	45.16229	-123.25187	721	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	84				

Riverbend Landfill

Cover Integrity Monitoring and Surface Emissions Monitoring

Work Order Summary Sheet - Fourth Quarter 2021

Initial Monitoring Event							Corrective Action		1st 10-day Follow-Up		2nd 10-day Follow-Up		1-Month Follow-Up	
Work Order#	Date	Type (SEM / Cover)	Description	Longitude	Latitude	CH_4 (ppm)	Date	Description	Date	CH_4 (ppm)	Date	CH_4	Date	CH_4 (ppm)
O028	10/20/2021	Penetration > 500 ppm	RB17V320	45.16195	-123.25190	5,700	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	12				
O029	10/20/2021	Penetration > 500 ppm	RBPWC003	45.16189	-123.25198	1,600	10/28/2021	placed clean wet soil all around well and created a seal.	10/29/2021	481				
O030	10/20/2021	Penetration > 500 ppm	RB21J014	45.16138	-123.25209	752	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	72				
O031	10/20/2021	Penetration > 500 ppm	RB21HO82	45.16139	-123.25206	2,300	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	70				
O032	10/20/2021	Penetration > 500 ppm	UNMARKED, Riley to ID	45.16145	-123.25191	975	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	188				
O033	10/20/2021	Penetration > 500 ppm	RVBDH047	45.16384	-123.25164	871	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	30				
O034	10/21/2021	Penetration > 500 ppm	RVBDH037	45.16063	-123.24923	850	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	1,334	11/8/2021	46		
O035	10/21/2021	Penetration > 500 ppm	RB20V372	45.16044	-123.24908	3,400	10/28/2021	Dug around pipe. Discovered fernco to 10" boot pipe had settled. Reattached fernco and covered with soil.	10/29/2021	8				
O036	10/21/2021	Penetration > 500 ppm	RB20V379	45.15994	-123.24808	611	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	5,239	11/8/2021	21		
O037	10/21/2021	Penetration > 500 ppm	RVBDH055	45.16046	-123.24853	529	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	94				
O038	10/21/2021	Penetration > 500 ppm	RB18V340	45.16149	-123.24946	6,000	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	3				
O039	10/21/2021	Penetration > 500 ppm	RVBDV197	45.16204	-123.24825	997	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	207				
O040	10/21/2021	Penetration > 500 ppm	RB16V310	45.16222	-123.24812	1,100	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	105				
O041	10/20/2021	Penetration > 500 ppm	RB19J009	45.16091	-123.25146	2,000	10/28/2021	Placed a large amount of clean soil around well. Compacted.	10/29/2021	74				
O042	10/20/2021	Penetration > 500 ppm	RB21V397	45.16104	-123.25137	649	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	846	11/8/2021	30		
O043	10/20/2021	Penetration > 500 ppm	RVBDV205	45.16135	-123.25140	6,000	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	135				
O044	10/20/2021	Penetration > 500 ppm	RB21V399	45.16109	-123.25064	5,999	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	428,180	11/8/2021	228		
O045	10/20/2021	Penetration > 500 ppm	WELLHO83	45.16083	-123.25022	1,500	10/28/2021	Placed a large amount of clean soil around well. Compacted.	10/29/2021	186				
O046	10/20/2021	Penetration > 500 ppm	RB21V402	45.16127	-123.24970	900	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	2				
O120	10/21/2021	Penetration > 500 ppm	RVRSB030	45.16250	-123.24918	2,500	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	2				
O121	10/21/2021	Penetration > 500 ppm	RVBDV175	45.16297	-123.24868	528	10/28/2021	Dug around pipe and bentonite sealed. Covered with soil and compacted.	10/29/2021	54				
O140	10/21/2021	Penetration > 500 ppm	RB16V313	45.16151	-123.24673	623	10/28/2021	Placed a large amount of clean soil around well. Compacted.	10/29/2021	217				
O141	10/21/2021	Penetration > 500 ppm	RB18V354	45.16210	-123.24757	1,363	10/28/2021	Placed a large amount of clean soil around well. Compacted.	10/29/2021	3				

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O001	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16079
CH_4 (ppm)	502	Longitude	-123.25053
Description	Surface, north side of Mod 2 road		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	51				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O002	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16078
CH_4 (ppm)	1,036	Longitude	-123.25076
Description	Surface, north side of Mod 2 road		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding	x	
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	17				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O003	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16069
CH_4 (ppm)	643	Longitude	-123.25166
Description	Surface, Mod 1 road		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	71				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O004	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16070
CH_4 (ppm)	973	Longitude	-123.25229
Description	Surface, Mod 1 road		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	266				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O005	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16090
CH_4 (ppm)	1,000	Longitude	-123.25147
Description	Surface, next to RB19J009		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding	x	
Seeps		x	Erosion	x	
Surface cracks or openings	x		Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	438				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O006	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.15970
CH_4 (ppm)	506	Longitude	-123.24624
Description	RVBDH001		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	36				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O007	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16080
CH_4 (ppm)	2,450	Longitude	-123.24651
Description	RB20V384		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	176				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O008	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16112
CH_4 (ppm)	2,203	Longitude	-123.24674
Description	RB16V316		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	334				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O009	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16279
CH_4 (ppm)	1,243	Longitude	-123.24697
Description	RVBDV122		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring						
Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	4				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O010	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16168
CH_4 (ppm)	892	Longitude	-123.24774
Description	RVBDV193		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	147				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O011	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16143
CH_4 (ppm)	500	Longitude	-123.25176
Description	Surface		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	43				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O012	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16082
CH_4 (ppm)	645	Longitude	-123.25071
Description	Surface		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	315				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O013	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16077
CH_4 (ppm)	1,400	Longitude	-123.25043
Description	Surface		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	77				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O014	Type	Surface > 500 ppm
Date	10/20/2021	Latitude	45.16311
CH_4 (ppm)	500	Longitude	-123.25225
Description	Surface, tarped area		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Used expanding foam and buytle tape to seal area with escaping gas.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021	11/9/2021	11/20/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	34,154	4			

Additional Corrective Actions *(if necessary)*

Date Completed: 11/5/2021

Description: Exposed more tarp and discovered opening. Filled in with expanding foam.

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O015	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16335
CH_4 (ppm)	1,200	Longitude	-123.24583
Description	RBOT0012		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021	11/10/2021	11/21/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	1,918	120			

Additional Corrective Actions *(if necessary)*

Date Completed: 11/5/2021

Description: Added clean soil around well

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O016	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16342
CH_4 (ppm)	600	Longitude	-123.24645
Description	RBHL0002		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Filled hole from previous repair with clean soil and compacted

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	47				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	0017	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16118
CH_4 (ppm)	1,600	Longitude	-123.24354
Description	Mod 6/7 Riser Pipe		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	357				

Additional Corrective Actions *(if necessary)*

Date Completed

Description

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O021	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16116
CH_4 (ppm)	1,004	Longitude	-123.25281
Description	RB19J013		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	48				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O022	Type	Penetration > 500 ppm
	Date	10/20/2021	Latitude	45.16412
	CH_4 (ppm)	1,400	Longitude	-123.25317
	Description	RB17SB66		

	Description	Yes	No	Description	Yes	No
Visual Observations	Exposed Waste		x	Settling		x
	Distressed Vegetation		x	Ponding		x
	Seeps		x	Erosion		x
	Surface cracks or openings		x	Odors		x
	Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug in an area around flag. Placed a layer of bentonite. Covered with soil and compacted.

SEM Remonitoring	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
	Due Date	10/30/2021		11/20/2021		
	Date Completed	10/29/2021				
	CH_4 (ppm)	8				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O023	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16355
CH_4 (ppm)	9,400	Longitude	-123.25267
Description	WELL370		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Used expanding foam and buytle tape to seal area with escaping gas.

SEM Remonitoring						
Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	120				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O024	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16339
CH_4 (ppm)	2,020	Longitude	-123.25269
Description	RB17SB63		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Removed inactive well and placed a patch around the area where the well was. Sealed with expanding foam and buytle tape.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	414				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O025	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16324
CH_4 (ppm)	774	Longitude	-123.25231
Description	RB19V369		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Used expanding foam and buytle tape to seal area with escaping gas.

SEM Remonitoring

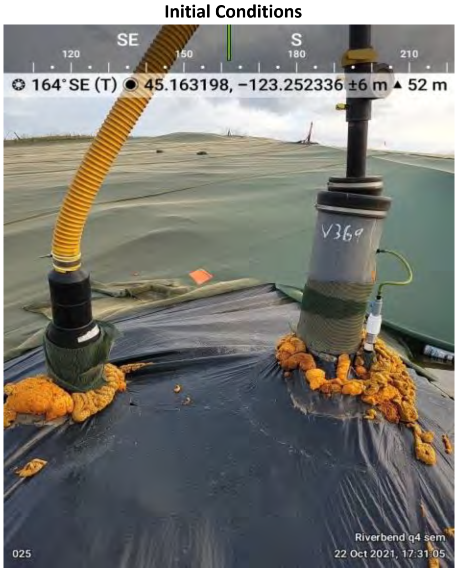
Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021	11/9/2021	11/20/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	5,176	84			

Additional Corrective Actions *(if necessary)*

Date Completed: 11/5/2021

Description: Applied additional foam and tape to seal gaps and cracks

Initial Conditions



Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O026	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16300
CH_4 (ppm)	700	Longitude	-123.25216
Description	Tarp Well		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Removed inactive well and placed a patch around the area where the well was. Sealed with expanding foam and buytle tape.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021	11/9/2021	11/20/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	1,479	3			

Additional Corrective Actions *(if necessary)*

Date Completed: 11/5/2021

Description: Applied additional foam and tape to seal gaps and cracks

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O027	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16229
CH_4 (ppm)	721	Longitude	-123.25187
Description	RB17V322		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	84				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O028	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16195
CH_4 (ppm)	5,700	Longitude	-123.25190
Description	RB17V320		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	12				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O029	Type	Penetration > 500 ppm
	Date	10/20/2021	Latitude	45.16189
	CH_4 (ppm)	1,600	Longitude	-123.25198
	Description	RBPWC003		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: placed clean wet soil all around well and created a seal.

SEM Remonitoring	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
	Due Date	10/30/2021		11/20/2021		
	Date Completed	10/29/2021				
	CH_4 (ppm)	481				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O030	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16138
CH_4 (ppm)	752	Longitude	-123.25209
Description	RB21J014		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	72				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O031	Type	Penetration > 500 ppm
	Date	10/20/2021	Latitude	45.16139
	CH_4 (ppm)	2,300	Longitude	-123.25206
	Description	RB21HO82		

	Description	Yes	No	Description	Yes	No
Visual Observations	Exposed Waste	x		Settling		x
	Distressed Vegetation		x	Ponding		x
	Seeps		x	Erosion		x
	Surface cracks or openings	x		Odors		x
	Other					

Corrective Actions	Date Completed	10/28/2021
	Description	Dug around pipe and bentonite sealed. Covered with soil and compacted.

	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
SEM Remonitoring	Due Date	10/30/2021		11/20/2021		
	Date Completed	10/29/2021				
	CH_4 (ppm)	70				

Additional Corrective Actions *(if necessary)*	Date Completed	
	Description	

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O032	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16145
CH_4 (ppm)	975	Longitude	-123.25191
Description	UNMARKED, Riley to ID		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste			Settling		
Distressed Vegetation			Ponding		
Seeps			Erosion		
Surface cracks or openings			Odors		
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	188				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O033	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16384
CH_4 (ppm)	871	Longitude	-123.25164
Description	RVBDH047		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	30				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O034	Type	Penetration > 500 ppm
	Date	10/21/2021	Latitude	45.16063
	CH_4 (ppm)	850	Longitude	-123.24923
	Description	RVBDH037		

Visual Observations	**Description**	**Yes**	**No**	**Description**	**Yes**	**No**
	Exposed Waste		x	Settling		x
	Distressed Vegetation		x	Ponding		x
	Seeps		x	Erosion		x
	Surface cracks or openings	x		Odors	x	
	Other					

Corrective Actions	Date Completed	10/28/2021
	Description	Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
	Due Date	10/31/2021	11/10/2021	11/21/2021		
	Date Completed	10/29/2021	11/8/2021			
	CH_4 (ppm)	1,334	46			

Additional Corrective Actions *(if necessary)*	Date Completed	11/5/2021
	Description	Applied more bentonite to penetration

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O035	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16044
CH_4 (ppm)	3,400	Longitude	-123.24908
Description	RB20V372		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe. Discovered fernco to 10" boot pipe had settled. Reattached fernco and covered with soil.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	8				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O036	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.15994
CH_4 (ppm)	611	Longitude	-123.24808
Description	RB20V379		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed	10/28/2021
Description	Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021	11/10/2021	11/21/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	5,239	21			

Additional Corrective Actions *(if necessary)*

Date Completed	11/5/2021
Description	Applied more bentonite to penetration

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O037	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16046
CH_4 (ppm)	529	Longitude	-123.24853
Description	RVBDH055		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	94				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O038	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16149
CH_4 (ppm)	6,000	Longitude	-123.24946
Description	RB18V340		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	3				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O039	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16204
CH_4 (ppm)	997	Longitude	-123.24825
Description	RVBDV197		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed	10/28/2021
Description	Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	207				

Additional Corrective Actions *(if necessary)*

Date Completed	
Description	

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O040	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16222
CH_4 (ppm)	1,100	Longitude	-123.24812
Description	RB16V310		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	105				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O041	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16091
CH_4 (ppm)	2,000	Longitude	-123.25146
Description	RB19J009		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed a large amount of clean soil around well. Compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	74				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O042	Type	Penetration > 500 ppm
	Date	10/20/2021	Latitude	45.16104
	CH_4 (ppm)	649	Longitude	-123.25137
	Description	RB21V397		

Visual Observations	**Description**	**Yes**	**No**	**Description**	**Yes**	**No**
	Exposed Waste	x		Settling		x
	Distressed Vegetation		x	Ponding		x
	Seeps		x	Erosion		x
	Surface cracks or openings		x	Odors	x	
	Other					

Corrective Actions	Date Completed	10/28/2021
	Description	Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
	Due Date	10/30/2021	11/9/2021	11/20/2021		
	Date Completed	10/29/2021	11/8/2021			
	CH_4 (ppm)	846	30			

Additional Corrective Actions *(if necessary)*	Date Completed	11/5/2021
	Description	Applied more bentonite to penetration

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O043	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16135
CH_4 (ppm)	6,000	Longitude	-123.25140
Description	RVBDV205		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste	x		Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	135				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O044	Type	Penetration > 500 ppm
	Date	10/20/2021	Latitude	45.16109
	CH_4 (ppm)	5,999	Longitude	-123.25064
	Description	RB21V399		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

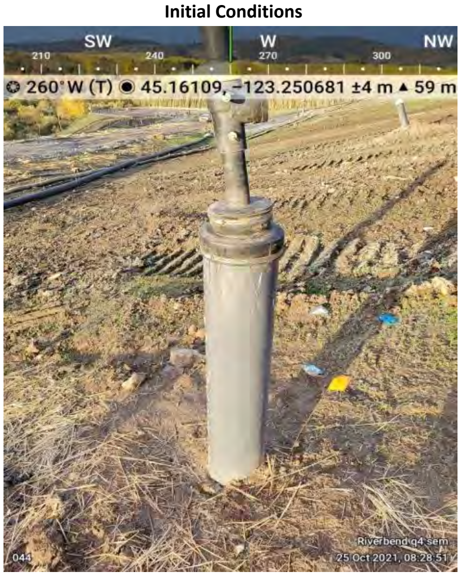
SEM Remonitoring					
Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021	11/9/2021	11/20/2021		
Date Completed	10/29/2021	11/8/2021			
CH_4 (ppm)	428,180	228			

Additional Corrective Actions *(if necessary)*

Date Completed: 11/5/2021

Description: Added clean soil

Initial Conditions



Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O045	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16083
CH_4 (ppm)	1,500	Longitude	-123.25022
Description	WELLHO83		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors	x	
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed a large amount of clean soil around well. Compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	186				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O046	Type	Penetration > 500 ppm
Date	10/20/2021	Latitude	45.16127
CH_4 (ppm)	900	Longitude	-123.24970
Description	RB21V402		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/30/2021		11/20/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	2				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading	Work Order #	O120	Type	Penetration > 500 ppm
	Date	10/21/2021	Latitude	45.16250
	CH_4 (ppm)	2,500	Longitude	-123.24918
	Description	RVRSB030		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings	x		Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

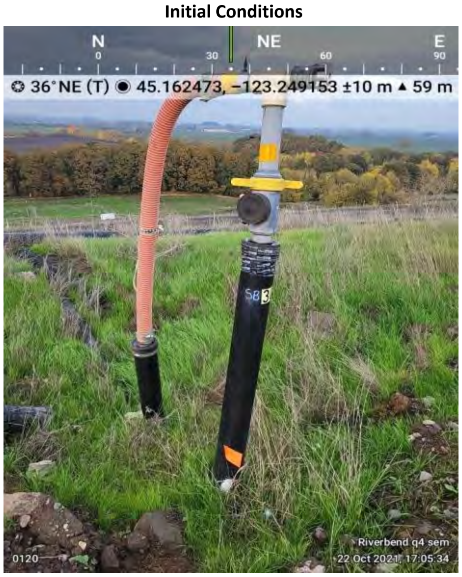
SEM Remonitoring						
	Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
	Due Date	10/31/2021		11/21/2021		
	Date Completed	10/29/2021				
	CH_4 (ppm)	2				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions



Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O121	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16297
CH_4 (ppm)	528	Longitude	-123.24868
Description	RVBDV175		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Dug around pipe and bentonite sealed. Covered with soil and compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	54				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	O140	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16151
CH_4 (ppm)	623	Longitude	-123.24673
Description	RB16V313		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste		x	Settling		x
Distressed Vegetation		x	Ponding		x
Seeps		x	Erosion		x
Surface cracks or openings		x	Odors		x
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed a large amount of clean soil around well. Compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	217				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions

Riverbend Landfill

Surface Emissions Monitoring

Monitoring Flag Tracking Sheet

Initial Reading

Work Order #	0141	Type	Penetration > 500 ppm
Date	10/21/2021	Latitude	45.16210
CH_4 (ppm)	1,363	Longitude	-123.24757
Description	RB18V354		

Visual Observations

Description	Yes	No	Description	Yes	No
Exposed Waste			Settling		
Distressed Vegetation			Ponding		
Seeps			Erosion		
Surface cracks or openings			Odors		
Other					

Corrective Actions

Date Completed: 10/28/2021

Description: Placed a large amount of clean soil around well. Compacted.

SEM Remonitoring

Type	1st 10-Day	2nd 10-Day	1-Month	Extra 10-Day	Extra 1-Month
Due Date	10/31/2021		11/21/2021		
Date Completed	10/29/2021				
CH_4 (ppm)	3				

Additional Corrective Actions *(if necessary)*

Date Completed:

Description:

Initial Conditions

Remediated Conditions